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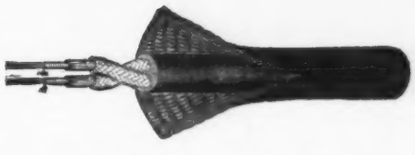

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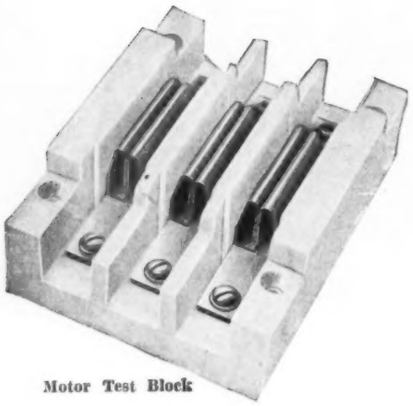

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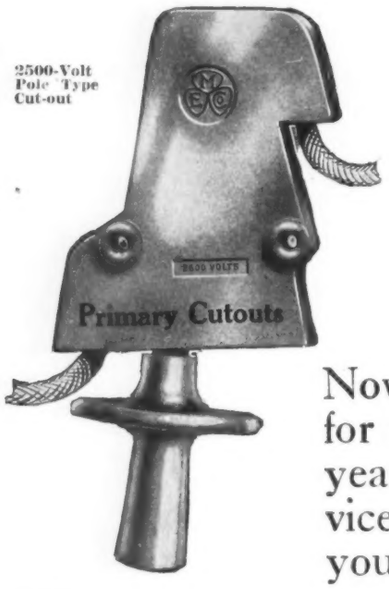

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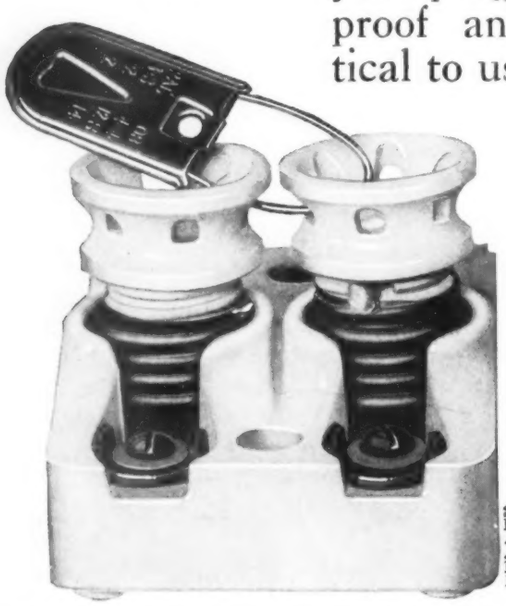

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Electrical World

The consolidation of Electrical World, Electrical Engineer and American Electrician

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"Old Men for Counsel"

FOR the next ten or twenty years we shall be working in a different kind of an economic world. Conditions have been altered and the rules of business will be changed in many ways. And he who senses this most thoroughly will be the most successful.

Through the twenty years just passed we have been trading in a rising market. We have grown accustomed to it. We have shaped our methods and our policies to conform to it. It has inclined our very manner of thinking, because these continuing conditions have become the fundamentals of the business world. But now the war has suddenly confused it all and turned things generally topside down.

SO THE wise economists have studied back into old times to find out what we may expect. And they tell us that for twenty years or more to come we shall be doing business on a falling market. And when you stop to think of it, this is a matter of tremendous import. For it means no less than that we all must change our ways of doing business and cease following the guidance of the very rules that we all have learned to trust.

Most of the knowledge which men use in their affairs comes out of the experience of their own times. They learn by what they do and what they see and what they hear. This plus the judgment left recorded by preceding generations forms our practical workday education. We know what we have learned. And now behold what we have learned is not what we must know.

THE present situation, therefore, will demand a new kind of knowledge and a different way of thinking. Much experience gained under the stimulating influences of a habitually rising market will have to be laid aside and unlearned. And the young men whose memories and experiences fail to reach back to the preceding period of falling markets must take counsel with old men to find out what to do.

After the Civil War there was a period of falling prices that lasted for thirty years. Men who lived in business then remember what it meant and how the times of this succeeding generation have differed. From their records and their recollections there can be developed the essential guidance for the men of the more active ranks today. No one can safely trust to himself alone to find his way in a new country. It is with just this point in view that the new problems of the coming years should be approached. *"Old men for counsel"*—here is a bit of well-seasoned advice that may profitably be applied by business men today.

Edward Julian Nally

Pioneer in the field of communication — an executive whose vision and energy are bringing wireless into worldwide use.

IN ALL of the branches of the electrical art there has been no greater development in recent years than in that devoted to radio communication. While it is true this has been made possible only by engineering achievement, nevertheless it required the broad thinking and direction of an executive to bring its benefits into widespread use.

Such has been the accomplishment of E. J. Nally, president of the Radio Corporation of America. Mr. Nally grew up in the telegraph field and came into wireless in 1913 with all of the traditions of wire communication back of him. His, however, has always been the spirit of the pioneer and here he saw an opportunity to build. His many years in the telegraph field gave him a background of experience which has stood him in good stead and has most certainly prevented many false starts from being made in the field of radio communication.

Mr. Nally was born in Philadelphia, Pa., April 11, 1859. He had opportunity for but few years of schooling. At the age of fifteen he was a Western Union messenger boy in St. Louis, Mo. A little later he became office boy for Colonel Clowry, late president of the Western Union, and was advanced to assistant to the superintendent in the St. Louis and Milwaukee districts. In 1890 he joined the Postal Telegraph Cable Company as assistant general superintendent with headquarters in Chicago. Two years later he was general superintendent, and in 1906 he went to New York as vice-president. Later he was elected first vice-president and general manager and continued as such until 1913, when he entered the radio field as vice-president and general manager of the Marconi Wireless Telegraph Company of America.

In all branches of electrical communication Mr. Nally has pioneered. While in St. Lou's he was temporarily in charge of the first Edison telephone exchange, when the Edison telephone was owned and operated by the Western Union Telegraph Company. He prepared the original estimates for the first telegraph lines to follow all of the transcontinental railroad lines. These lines were constructed during the years 1880 to 1900. During the time he was in Chicago as general superintendent the entire Postal Telegraph system in the Middle and Far West was built, and that in the Southwest after his transfer to New York.

Immediately upon his association with the Marconi company, the radio field began to feel the beneficial effects of his energy and vision. He organized the company for commercial service and just before the outbreak of the war arranged for the first commercial radio service between the United States and Europe. Later in 1914 the Marconi company started a similar service between California and Hawaii and in 1916 completed the bridging of the Pacific by starting service with Japan. When on March 1, 1920, the government returned the radio stations to their owners, Mr. Nally established for the first time a direct transatlantic commercial radio circuit. This was with England and was soon followed by similar services to Norway, Germany and France.

Upon the merger in 1919 of the American Marconi interests and the radio activities of the General Electric Company and the American Telephone & Telegraph Company and its subsidiary, the Western Electric Company, into the Radio Corporation of America, Mr. Nally was chosen president. Immediately plans were made for worldwide wireless. A central radio plant for simultaneous communication with the entire globe was conceived, the first unit of which went in service Nov. 5 last. Mr. Nally also was instrumental in bringing about last fall the co-operative agreement between the four principal radio companies of the United States, Great Britain, France and Germany for scientific and commercial radio development.

Editorial Comment

Electrical World, March 11, 1922

Volume 79 Number 10

Advantages of the Budget System in Utility Operation

THE necessity of a sound financial policy on the part of public utilities cannot perhaps be emphasized too often. Any going concern doing an active business must look sharply not only after its receipts and expenditures but also after the sources of money which may be temporarily or permanently needed during the progress of its operations. Most concerns of every kind are attempting to do vastly more business than their actual financial resources justify, which is why some of them get hard hit at times. The ordinary utility, and particularly the light and power utility, can as a rule look forward with some degree of certainty to its probable earnings during the coming year and know to a reasonable extent its probable outgo. It should also know what it sometimes does not—just where any excess demands for money would come from.

If the budget system were systematically adopted, particularly by many of the smaller companies in which contingencies are a large part of the total possibility of expense, the whole business would be put on a safer basis, for at the beginning of each fiscal year, knowing from experience ordinary sources of income as distributed month by month, it would be practicable to arrange in advance for any accommodation that might be needed, to keep reserve resources in sight in case of extraordinary expense through accident or other cause, and to make sure that at least for a twelvemonth ahead the necessities are fully taken into account. The form of a budget scheme cannot properly be standardized. The system must of necessity vary from company to company. The main point, however, is that the same scheme of foresight which has proved itself so valuable on a large scale can be advantageously used in the everyday operations of the smaller utilities.

The Mission of the Engineer

IN HIS enthusiasm for an enlarged field of activities is the engineer losing his sense of proportion and forgetting fundamentals? The engineer is a member of society, owing a duty to the community proportional to his abilities. His profession is, however, only one of many lines of work that go to make up the sum total of human activity. The needs of his profession have forced him to develop certain talents that can and must be made of immense value in the great problems of government and social affairs. The full use of those talents will not be possible until he is able to see clearly the relationship between the theoretical elements of his profession and the practical needs of every-day affairs.

Engineering, broadly speaking, is a method or group of methods by which the facts in any situation are ascertained and a solution is worked out. Much time has been frequently spent by engineers in working out the technical facts in a problem and little or no time in ascertaining the related facts from the other angles. The engineer's job is never well done until he has weighed all the facts, technical, economical and otherwise, and arrived at a decision that properly represents all those facts. His mission in the world is neither greater nor less than that of every individual. It is to do well and faithfully all things that fall to his lot. Many times that will involve results which are bad if judged by purely technical standards. A service rendered by means of which the comfort and health of many are advanced is worth infinitely more than an ideal service that only a few can enjoy.

Ontario's Hydro-Electric Service Most Costly

THROUGHOUT the country there exists a very general and fixed impression that electricity is cheaper in Ontario than anywhere else. Certainly the Hydro-Electric Power Commission of Ontario, which provides the greater part of the electric service in the Canadian province, believes so, and the hundreds of municipalities which purchase their supply from it are also convinced on that point. It must come as a shock to them, therefore, to be told that the exact opposite is the case, and that the privately owned electric utilities of Quebec and the United States not only supply a cheaper service but a better service as well. A very elaborate report containing this conclusion has just been made by W. S. Murray, who conducted the United States government's Superpower Survey last year. Inasmuch as Mr. Murray has also acted in a consulting capacity for municipal and provincial authorities in Canada, his findings gain added weight, since his leaning would naturally be supposed to lie on the side of government.

With the engineering work of the Hydro-Electric Power Commission of Ontario little fault can be found. It is of a high order. For efficiency no hydro-electric station at Niagara Falls is comparable to the commission's Queenston station, which generates twice as much electricity from the same amount of water as any other station there. But when one delves into costs and gets under the surface of things, as Mr. Murray has done, the picture is not so attractive. Last December, when the first unit in the Queenston station was started, we commented on the fact that whereas the Hydro-Electric Power Commission formerly bought its electricity from a private company at Niagara Falls for $9 a horsepower-year, the commission could not now produce it at Queenston for twice that sum. Mr. Murray is not so considerate. Despite his admiration for Sir Adam Beck, he hews to the line and lets the chips fall where they may. The cost of producing a horsepower-year of electricity in the mammoth Queenston station he estimates at $28.05, and as this station will hereafter be the chief source of power for the munic-

ipalities in Ontario, the effect of this increased cost on the present rate schedule is apparent.

Of still greater interest is the comparison made between the municipally owned and the private electric public utilities of Ontario, Quebec and some sections of the United States. This is based on official statistics, and the more these are studied the more they reveal. The Canadian statistics, having been gathered by the Dominion government itself, are obviously not open to question. If the Hydro-Electric Power Commission of Ontario, in the light of facts ascertained by the Canadians themselves, now makes such a poor showing, what will be the result when the political camel finally succeeds in forcing its head and then its entire body under the tent? The record of other government-owned systems throughout the world offers no encouragement to believe that the situation will improve, and believers in private ownership will be confirmed in their convictions by the discovery that this god set up in Ontario has feet of clay.

Why Can We Not Learn This Lesson Now?

ELECTRICAL men have long talked about the investment value of the wiring of a house, but they have never made their point especially strong. The installation of electric service, they say, increases the worth of the property, but it has usually been presented as a matter of theory, a bit of argument, another of a list of statements which the salesman advances in his effort to win an order. And so the advantage that should have been derived from one of the most vital considerations in the mind of every home owner has been virtually lost. It has remained for the "home electric" to provide a practical demonstration of the fact that electrical equipment pays for itself immediately with a large measure of profit.

In Louisville they built a "home electric" which the builder estimated should be sold for a certain figure, but when the house was wired and equipped with appliances and the crowds were looking at it his courage grew and he marked it $4,000 higher and sold it at that price. In Cleveland a "home electric" brought $10,000 more than was intended. In California several of the "modern electric homes" that have been so successfully exhibited there were bought at values greater than the owner had expected before the installation of electric comforts turned his houses into homes and made them worth more than they were before. And so it goes. There is an almost unbroken record of such experiences across the country—each case another bit of undeniable evidence that wiring pays, not in some vague, intangible benefit, but in an immediate and concrete increase in real estate value and salability.

Out of all this will come some day a confidence in our own works. Eventually the central-station salesman and the wiring contractor will believe. But, in the words of Pillsbury, "why not now?" The plumbing industry learned this lesson long ago, and instead of selling just a kitchen sink it began to sell bathrooms in every home. It has had the courage and the skill to sell not just the essential length of pipe and anything that would serve in the way of basin, tub and toilet. It has built up the standard of plumbing until today it sells in every home the utmost in convenience, style and luxury that the customer can possibly afford. And yet, with the lesson of all this before him, the electrical man goes on installing wiring—barely enough—and leaving the appliances to be purchased later. The "home electric" is proving time after time that the clothes washer, ironing machine, dishwasher, refrigerator and vacuum cleaner should be made part of the home when it is built, because they add many times their cost to the market value of the house. Why can we not learn this lesson now?

Continental Development Greatly Stimulated by Necessity

LAST week some late news regarding continental practice was summarized by A. Dyckerhoff which gives an excellent indication of the pace set by necessity on the other side of the water. One of the curious effects of the post-war situation, especially in Germany, seems to be the fervid activity of the manufacturing plants due to the general financial situation, and particularly to exchange rates, which has created a demand for electric power to an extent altogether surprising. In industrial districts the central stations cannot take care of the work that is thrust upon them, and many of them are suffering from low power factor, a condition which seems to be even more serious than it is here.

Apparently no generalized scheme for dealing with the power-factor situation has been worked out, the difficulties on both sides of the Atlantic being obviously the same. A good many Continental plants are introducing rates based on the reactive component of load, although they have not yet a suitable single meter for use under this plan. Following American practice, they are using two instruments, one measuring the active component and the other the reactive. Static condensers apparently have not yet established their usefulness, and synchronous condensers, so successful here, are rarely employed. The usual practice is to deal locally with the chief offenders, namely, the big induction motors, by installing electromagnetic devices. They compensate the reactive currents successfully, but at the cost of what seems at first glance to be considerable complication, complication at least as serious as that presented by the synchronous condenser. There may be cases, however, where the specialized phase advancers could be well employed here to meet some particular requirement.

Engine and boiler practice seem to have been pushed further in the direction of economy than in this country, the high cost of fuel being a vigorous stimulant to bettering efficiencies. In some of the large Continental plants efficiencies of 80 to 83 per cent in the boilers have been reached using coal as fuel, while the extraordinary figure of 87½ per cent has been reported with boilers using blast-furnace gas. Furthermore, guarantees as low as 11 lb. of water per kilowatt-hour are being made on 20,000-kw. units when operating at full load. This size of unit or one approximating it seems to be a favorite, although in one instance at least turbo-generators of 60,000-kva. rating have been put into service. More significant is the renewed activity in big gas engines, which in this country have dropped very much to the rear. The biggest units in regular service abroad are about 4,000 kw., operating at efficiencies high enough to give one net kilowatt-hour per 12,500 B.t.u. Vigorous efforts, too, have been made to utilize the exhaust gases from the engines in the generation of steam, and mixed-power plants involving their use have been installed in various places. Particularly significant is the fact that gas turbines also are making headway, some units of substantial size having been already tested with fairly good results.

On the electrical side of advancement particular mention should be made of mercury rectifiers, of which standard sizes in operation now run as high as 500 kw. each, with a promise of more than doubling this figure. The indications are that this apparatus is sufficiently close to a working success on a large scale to demand very close attention on the part of engineers here.

Reducing Cost of Transformer Inspection

THERE has been lately a great deal of discussion regarding the value of transformer inspection. Such inspection, broadly speaking, should include the condition of bushings and leads, the quantity and condition of the oil in the transformer and the condition of the fuses and lightning arresters. When transformers are banked the inspection should also determine whether or not the transformer is damaged after its fuses have been blown. It is evident that when transformers are not banked any complaint of the customer as to service interruption will usually result in finding the trouble at the transformer.

The ruggedness of present transformers has led many to believe that inspection is not necessary. However, if transformers are to be operated at maximum economy, it may be necessary to load them at peak demands to a point not far from the one at which dangerous temperatures would occur. This is particularly true of lighting loads or any load with a low load factor. Moreover, with higher load factors it is not economical to carry overload of equal magnitude. Evidently operation under such conditions requires constant knowledge of what the transformers are doing and therefore makes inspection necessary. In any case it is important to know the economical loading of transformers and to plan as near an approach to this as possible. Then inspection expenses will be a minimum. An overload indicator, easily visible, appears to be the biggest step in this direction that presents itself nowadays to operators.

The Fundamentals of Inductive Interference

IN ALL of the public discussions on inductive interference it has been difficult to obtain a comprehensive view of the entire problem. To list and discuss all of the details would be a practical impossibility because of the scope of the subject and the fact that many of the problems involved are as yet either unknown or very imperfectly known. However, the time now seems ripe to present from legal, technical and business viewpoints the fundamentals that must be clearly realized before a real solution of any of the numerous detail problems can be arrived at.

Fundamentally the problem is a business one in which business men responsible for solving utility problems must find methods of giving the public several phases of service on which the success of the electrical industry is based, at the least possible cost, with the least interference between classes of service in which the public is interested. Public interest is paramount, and it cannot be assumed that users of electric service must choose which classes of service they will have and which they will do without. With this viewpoint in mind there are certain legal obligations and technical considerations on which the compromises that must necessarily be made where the interests of two or more parties are involved will have to be based. In a series of three articles, the first of which appears in this issue, the problem from its legal, technical and business viewpoints will be presented shorn of the technical verbiage which might render it confusing.

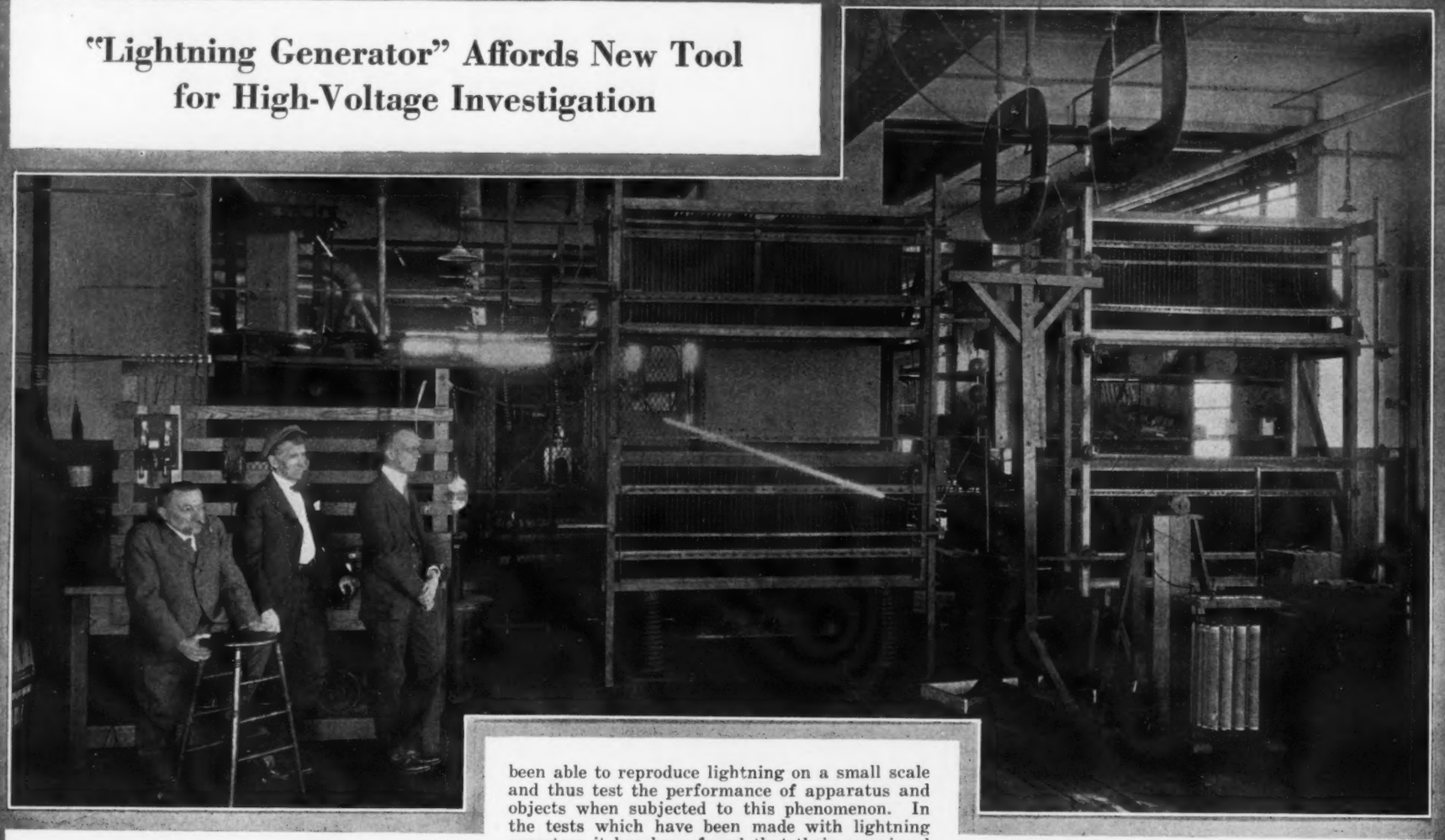
Compromise will be a large factor in the final settlement of any phase of the problem, but haphazard guesswork will not only fail to help but it may complicate the situation seriously. The time has arrived when the fundamental facts must be faced and answers sought to the definite legal and technical questions which will permit of intelligent and effective compromise on the basis of the greatest interest of those who use the service of electric utilities. In the final analysis this is the only true interest of the electrical industry.

Skin Effect in Large Stranded Cables

THE unequal distribution of alternating current over the cross-section of the conductor, commonly known as the "skin effect," is due to the greater magnetic flux surrounding the inner filaments of current, thus increasing their inductance. For circuits containing no iron, inductance, as usually understood, is a property of the dimensions of the circuit alone. For alternating currents, however, owing to the skin effect, the frequency becomes a factor in the value of the inductance. The problem of a statement of the exact value early attracted the attention of electricians versed in mathematics, for the problem is by no means simple. Solutions have been given by Sir William Thomson, Lord Rayleigh, and recently by Alexander Russell, who considers various positions of the return conductor.

For commercial frequencies and the sizes of solid conductor usually appearing in practice the skin effect is negligible. Until recently, therefore, engineers have been content to use simple but approximate formulas, such as that of Steinmetz, giving maximum possible values of the skin effect. With the introduction of the high frequencies of radio transmission and of the large stranded conductors of low-voltage distribution an entirely new set of special cases have arisen, for which neither the exact nor approximate formulas will serve. A recent A.I.E.E. paper by Middleton and Davis gives some interesting experiments with large stranded cables at commercial frequencies. One of the theoretical formulas referred to above indicates that a close approximation to the skin effect may be had by assuming that all of the current carried is limited to a surface layer of conductor of definite thickness, depending on the frequency. This applies to solid circular conductors. In the paper referred to the interesting conclusion is reached that large stranded cables obey the same law if the depth of penetration is calculated from the pitch diameter of the outer layer of strands. The agreement is found to hold for four widely different types of stranding. It is remarkable that there should be this close agreement between an exact theoretical deduction for the case of a solid circular conductor and the measured results on a large stranded conductor which departs radically from the assumptions used in the theory. The agreement therefore must be accepted as a happy outcome for the cables in question. It cannot, however, be safely assumed to hold in the cases of other types of cable nor at other values of frequency. As pointed out by the authors, it is highly desirable that similar experiments be made on other types of cable. If the same agreement can be found for all types of cable, it will be all the more remarkable and fortunate.

"Lightning Generator" Affords New Tool for High-Voltage Investigation



BY MEANS of apparatus which will give a momentary discharge of 10,000 amp. at 120,000 volts, Dr. C. P. Steinmetz, chief consulting engineer of the General Electric Company, and his co-workers J. L. R. Hayden and N. A. Lougee have been able to reproduce lightning on a small scale and thus test the performance of apparatus and objects when subjected to this phenomenon. In the tests which have been made with lightning arresters it has been found that their occasional failure to function properly is due to causes far different from those heretofore imagined. The apparatus consists essentially of 200 large glass plates arranged as a condenser for charging with rectified high-voltage electricity. Although the power and voltage back of the discharge produced are only one five-hundredth of the values for natural lightning, this apparatus will shatter blocks of wood and tree branches. There are prospects of making a still more powerful lightning generator.

Hydro-Electric System of Province of Ontario Investigated

W. S. Murray Finds It Inefficient, Expensive and Wasteful and That, Notwithstanding All the Claims Made for It, Service from Private Utilities in the United States and Canada Is Cheaper and Better

LARGEST AND MOST EFFICIENT STATION ON THE NIAGARA FRONTIER AND YET THE MOST UNECONOMICAL

THAT the Hydro-Electric Power Commission of Ontario, despite its broad powers, the cheapness of its funds and the advantageous location of its generating stations, does not supply such cheap or such reliable electric service as the privately owned electric utilities of Canada and the United States is the statement of W. S. Murray, former head of the United States government's Superpower Survey organization, in a report just made public by the National Electric Light Association.

This assertion is buttressed by a mass of contributory evidence gathered first-hand in Canada by Mr. Murray and Henry Flood, Jr., over a period of six months. The printed report they make contains more than 225 pages and charts. In it the engineers trace the development of the Hydro-Electric Power Commission of Ontario since its inception. They compare its growth and operation with the growth and operation of electric public utilities in the Province of Quebec and in sections of the United States, and give comparable and pertinent statistics on the bonded debt, revenue and operating expenses, taxes, wages, etc., of municipally owned and privately owned Canadian electric utilities.

The investigation was made for the purpose of obtaining complete economic data from which to draw a comparison between governmentally owned and privately owned utilities. This naturally led to a consideration of the political and economical structure of the Hydro-Electric Power Commission of Ontario, which operates the largest government-owned system in existence, and to a comparison between it and others privately owned and operated but subject to public regulation.

In summarizing the results of the investigation, Mr. Murray concludes that no such system of electric service as that operated by the Hydro-Electric Power Commission of Ontario is applicable in the United States, for the reason that it is subversive of American policy and custom and in addition is inefficient, expensive and wasteful. He shows that service rendered by privately owned utilities is cheaper and better than that rendered by governmentally owned utilities, and that even in Ontario, which is generally looked upon as furnishing the most successful example of government-owned utilities, private capital and enterprise have contributed most to the upbuilding of civic, industrial and commercial life.

A complete statement of Mr. Murray's conclusions and of the premises on which they are based is given on page 474.

At the very outset Mr. Murray points out the advantages possessed by hydro-electric stations situated at Niagara Falls. He says:

"The fact should not be permitted to escape for one moment that out of all the power generated for which the Hydro-Electric Power Commission stands sponsor in Ontario, 87 per cent is produced at Niagara, which, through the constancy of flow of the river bearing that name, in combination with a sheer drop at the escarpment at Niagara Falls of 220 ft. and a total drop of 326 ft. between Lake Erie and Lake Ontario within a distance of 27 miles, offers a site unexampled in the world where hydro-electric power can and should be produced cheaply. Therefore, in making cost comparisons with other power systems in the States and Canada, it must be remembered that not only are most of the other hydro-electric systems handicapped through their sites lacking the physical conditions which prevail at Niagara, but, owing to incomparably lesser drainage areas than that offered by the Great Lakes basin, their stream flows have great seasonal variations and, in general, are supplemented by steam-produced power."

The Hydro-Electric Power Commission of Ontario, of which Sir Adam Beck has been chairman since its formation in 1907, is clothed with unusual powers. Ontario in the Hydro-Electric Power Commission could have been made, says Mr. Murray, than that which is represented in the authority conferred upon it by the laws now on the statute books in the province, and in no man can there exist a greater honesty of mind and purpose than in Sir Adam Beck, who has been the indefatigable leader and chairman of this commission.

THE QUESTION OF TAXES

All property held by the government electric utilities in Ontario is tax-free with the exception of that applicable to land, so that the effect of taxes on the cost of power in Ontario is insignificant. Nevertheless the report shows that the taxes are not eliminated, they are merely redistributed. In this connection Mr. Murray appends a list of some of the taxes paid by the electric utilities in the districts other than Ontario.

The taxes received from the principal private companies in the Province of Ontario amounted to 7.1 per cent of their annual income, which affected the price of their power by 0.6 mill per kilowatt-hour generated and purchased. For the privately owned electric utility

COMPARATIVE STATISTICS FOR MUNICIPALITIES IN PROVINCES OF QUEBEC AND ONTARIO

(Derived from publications of the Dominion Bureau of Statistics for 1919)

	—Cities Over 100,000—		From 25,000 to 50,000		From 10,000 to 25,000		From 3,000 to 10,000	
	Quebec	Ontario	Quebec	Ontario	Quebec	Ontario	Quebec	Ontario
Number of cities	2	3	3	2	6	15	24	45
Aggregate population	821,150	715,153	81,824	64,629	91,774	254,246	141,097	229,134
Taxable property—total $1,000	696,859	850,439	40,908	48,673	96,706	169,833	55,304	115,625
Per capita—dollars	849	1,190	505	753	1,155	668	392	505
Bonded debt—$1,000	134,427	133,083	9,227	7,154	13,236	34,664	9,365	15,557
Per capita—dollars	164	187	113	111	145.50	136.50	66.50	68.00
Per cent bonded debt to taxable property—per cent	19.3	15.6	22.5	14.7	13.70	20.40	16.9	13.5
Compulsory taxes—total $1,000	14,727	26,224	674	1,406	1,782	6,263	1,008	4,599
Per capita—dollars	18.00	36.90	8.25	21.78	19.40	24.60	7.10	20.00
Average tax rate—mills per dollar	21.1	30.9	16.4	28.9	18.4	36.8	18.10	39.9
Total ordinary receipts—$1,000	22,527	49,263	1,195	2,454	2,998	11,613	1,886	7,218
Total ordinary expenses—$1,000	24,426	42,500	1,455	2,641	2,676	10,312	2,239	6,983
Excess receipts over expense—$1,000	1,899	6,763	260	187	322	1,301	353	235
Net sum required by taxation—$1,000	16,626	19,461	934	1,593	1,460	4,962	1,361	4,364
Per capita—dollars	20.20	27.20	11.41	24.65	15.90	19.60	9.68	18.95
Net tax rate required to balance receipts and expense—mills per dollar	23.9	22.8	22.8	32.75	15.10	29.20	24.80	37.8
Total ordinary expenses per capita—dollars	29.80	59.50	17.70	40.90	29.10	40.60	13.50	31.60
Per dollar of taxable property—mills	35.1	50.0	35.60	54.20	27.60	60.50	34.20	62.5
Total sinking fund	1,959	4,704	120	73	164	925	320	1,085
Per cent of sinking fund to bonded debt	1.45	3.54	1.30	1.02	1.24	2.67	3.41	6.97
Sinking fund in mills per dollar of assessed valuation	2.81	5.50	2.93	1.02	17.0	26.7	5.8	9.4

According to the power commission act it is a public service commission, an engineering company, an electric utility company, a holding company, a construction company, a banker, a manufacturer, a supply dealer and an underwriters' inspection bureau. It has exclusive jurisdiction as to all matters conferred upon it and nothing done by the commission within its jurisdiction is open to question or review in any action or proceeding or by any court. As a matter of fact no suit can be brought against the commission without fiat from the Attorney-General, and to date no fiat has ever been granted.

The Hydro-Electric Power Commission is the trustee for the generating and transmission properties of the utilities of Ontario, and to a very large extent it controls the electrical investments and operations of the municipalities themselves.

The government electric utilities in Ontario have grown from a league of seven municipalities formed in 1907 until now the vested interests of the people in this class of property are represented by investments totaling nearly $200,000,000, the bonded indebtedness of which is guaranteed by the Province of Ontario and which in 1920 represented 70 per cent of the debt of the province itself.

No greater attestation of the faith of the people of companies in the St. Lawrence Valley of the Province of Quebec the taxes were 6.53 per cent of the annual revenues and affected the cost per kilowatt-hour generated and purchased in the amount of 0.46 mill.

The rate structure as adopted by the Hydro-Electric Power Commission is remarkable because of its complete dissimilarity to anything else in existence.

In Ontario each system has a power center. Immediately in the vicinity of that center the cost of power is minimum. At the point farthest from the power center (measured in transmission distance, not distance in a straight line) the cost is maximum. For example, in 1920 the interim rate for power at Niagara Falls was $11.50 per horsepower-year, while at Windsor, 235 miles away, the cost was $36 per horsepower-year. Several systems of the Hydro-Electric Power Commission overlap zones taken about Niagara Falls as a center, and power sold to a municipality from one system may be at a price more than 500 per cent higher than that sold to a municipality within the same zone, but receiving power from another system.

The commission uses an interim wholesale rate. It is an estimated rate to the municipalities, and at the end of the year the municipality is credited or debited, depending upon whether the actual cost has been respectively lower or higher.

In the 1920 annual report of the commission the interim wholesale rates for 169 municipalities are given, while the actual wholesale rate paid can be computed for 174 municipalities. The highest interim wholesale rates that were quoted in this report were between $80 and $90 per horsepower-year, while the highest actual wholesale rates paid per horsepower were between $150 and $160 per horsepower-year. Altogether, there were nine municipalities which paid a rate higher than the maximum interim rate quoted.

COMPARISON OF GOVERNMENT-OWNED AND PRIVATELY OWNED UTILITIES

A mass of statistics is presented in the report to disprove the claims of the advocates of government ownership. The Province of Ontario in 1920 owned approximately one-half of its electrical utilities, and of the total utility income two-thirds was derived from those governmentally owned, while in Quebec the government-owned utilities, representing but 4 per cent of the investment in that class of property, receive about 5 per cent of the total revenue therefrom.

That the cost of power to the entire people of the Province of Quebec is less than that to the people of Ontario is shown in the report, and it is interesting to note the higher productivity as gained from salaries and wages paid in that province. The revenue per dollar of salaries and wages paid is also seen to be 32.5 per cent greater in Quebec than in Ontario.

In respect to economic operation as between governmentally owned and privately owned electric utilities in Ontario and Quebec, it is shown that the operating ratios between the privately owned and governmentally owned companies indicate a much lower per cent for the former.

AVERAGE COST OF POWER

Analyzing the actual average cost of power to the consumers per kilowatt-hour generated, the following comparisons are given:

In the Niagara district of Canada the government-owned electric utilities furnish this power at 9.25 mills; the private electric utilities of this district furnish it at 7.6 mills per kilowatt-hour generated, and the weighted average of these two supplies is 8.78 mills per kilowatt-hour.

DOMINION STATISTICS IN RESPECT TO THE COST OF POWER IN CANADA FROM PRIVATE AND GOVERNMENT-OWNED ELECTRIC UTILITIES

Item	Unit	Private Electric Utilities	Government Electric Utilities
Total capital invested	$1,000	287,568	128,954
Proportion of capital invested	Per cent	69.0	31.0
Total annual revenue	$1,000	35,553	22,301
Proportion of total revenue	Per cent	61.5	38.5
Total operating expense	$1,000	19,202	15,140
Proportion of total operating expense	Per cent	56.0	44.0
Total generating capacity	Kva.	1,115,494	375,266
Proportion of total capacity	Per cent	75.0	15.0
Operating ratio	Per cent	54.5	67.7
Proportion of operating expense in salaries and wages	Per cent	30.1	36.7
Average salary or wage per employee	Dollars	1,161	1,225
Revenue per employee	Dollars	6,870	4,970
Revenue per dollar of salary and wages	Dollars	5.91	4.05
Revenue from lighting	Per cent	29.2	44.2
Revenue from power and other properties	Per cent	70.8	55.8

In the United States, for a comparable zone supplied by Niagara Falls power, the average price of power to the consumer is 7.65 mills per kilowatt-hour generated. In the Province of Quebec, where power to the extent of 96 per cent is generated by private electric utilities and where the general zone of transmitted power is not unlike that of Ontario, the average cost to the consumer per kilowatt-hour generated is 6.6 mills.

The average cost of power—that is, the revenue per kilowatt-hour generated—for the American Niagara power district is about 17 per cent less than that for the total operations of the Hydro-Electric Power Commission and the municipal commissions for wholesale power delivered in the Canadian Niagara district, and it is about 13 per cent less than that for all the electric utilities in that district.

DOMINION STATISTICS IN RESPECT TO THE COST OF POWER IN QUEBEC AND ONTARIO

Item	Unit	Ontario	Quebec
Total investment	$1,000	$192,908	$130,000
Investment per capita	Dollars	73.50	52.40
Proportion of total capital in government-owned electric utilities	Per cent	49.7	4.0
Total revenue	$1,000	$26,007	$16,554
Per cent of revenue from government-owned electric utilities	Per cent	60.0	5.0
Total operating expense	$1,000	$16,021	$9,326
Generating capacity	Kva.	661,555	497,559
Generating capacity per capita	Kva.	0.252	0.20
Proportion of total capacity in government-owned utilities	Per cent	35	2.8
Revenue per dollar of invested capital	Cents	13.5	12.7
Operating expense per dollar of invested capital	Cents	8.3	7.2
Operating ratio	Per cent	61.3	56.5
Salaries and wages per dollar of invested capital	Cents	3.01	1.94
Per cent of total operating expense in salaries and wages	Per cent	36.3	27.1
Average annual salary or wage per employee	Dollars	1,225	1,055
Revenue per employee	Dollars	5,500	6,920
Revenue per dollar of salaries and wages	Dollars	4.49	6.65
Proportion total revenue from light	Per cent	27.6	26.6
Proportion total revenue from power and Other uses	Per cent	72.4	73.4

Comparing the average cost of retail power to the people residing within the municipalities served by the Hydro-Electric Power Commission in the Niagara district, it is found that the average cost of power to the people in the American district is less by about 4.45 mills per kilowatt-hour, or 40 per cent.

The report also calls attention to the fact that in the American Niagara district for each 1,000 of population a capacity of 65 per cent in excess of that in Canada is used. This greater capacity contains reserve against interruption of service, and notwithstanding a very considerable percentage of capacity in steam-operated, the cost of power to the consumers per kilowatt-hour generated on the American side is less.

Analysis shows that the average cost of power to the people of Quebec is 32 per cent less per kilowatt-hour generated than the cost to all the people receiving hydro-electric power in the Province of Ontario, while it is 27 per cent less than to the consumers in the Canadian Niagara district, whether they are served by government or privately owned electric utilities.

RELATION OF CAPITAL EXPENDITURES TO REVENUE

The efficiency of management of an electric utility may to some degree be gaged by the capital expenditure per dollar of revenue received, if the service rendered by the utility is on comparable conditions. This is particularly true when the relation is analyzed over a period of years, rather than for a single year. When the facilities for the production or distribution of power have been placed in operation, the fixed charges must be paid from revenue.

In connection with the operations of the Hydro-Electric Power Commission and those of the municipalities in Ontario, the capital additions in per cent of revenue are greater by 200 per cent than those for the American

companies in the Niagara district, and by 350 per cent than those for the Quebec companies operating in the St. Lawrence Valley.

THE QUEENSTON-CHIPPAWA DEVELOPMENT

Inasmuch as the new Queenston-Chippawa development of the Hydro-Electric Power Commission of Ontario will be the largest in the world and will constitute the commission's chief source of power a large part of the report made by Messrs. Murray and Flood is devoted to it. The cost of the project is dwelt on and its effect on the cost of service in Ontario. Some confusion exists apparently on its probable maximum output, this being variously estimated from 495,000 hp. to 650,000 hp. Operating with a net head of 305 ft., the Queenston station will develop 29.4 hp. per cubic foot of water per second used compared with 14.6 hp. for the Ontario Power Company. Nevertheless, Mr. Murray shows in this report that whereas the Hydro-Electric Power Commission of Ontario formerly purchased 100,000 hp. from the Ontario Power Company at a trifle more than $9 per horsepower-year, the cost of power to the municipalities of Ontario from the Queenston-Chippawa development based on the diversion of water in accordance with the existing international treaty will be $28.05 per horsepower-year plus $9.40 for transmission from Niagara Falls to the municipalities, or $37.45 in all. This is an increase over the cost of $19.80 per horsepower-year stated by the commission in its 1920 annual report of $17.65 per horsepower-year, or 89 per cent. The increase in production cost per horsepower-year at the point of delivery to the Niagara system from $10.40 for 1920 to $28.05 amounts to approximately 170 per cent.

Summary of Conclusions

AFTER a careful analysis of the governmentally owned, controlled and operated electric utility structure as represented in the Hydro-Electric Power Commission of Ontario, I am of the opinion, first, that the principles of its application can find no place in the United States; second, that to attempt the substitution of its principles of control and operation within the States would not only be to strike a blow at economic structures the present existence of which is far better equipped to protect the public interests in their conjunctive relation with the public service commissions of the states regulating their rates, but it would also be to strike an equal blow at the shareholders of the electric utilities which are now serving the American public; and, third, that the Hydro-Electric Power Commission owes its being only to the fact that a public service commission on the order of those operating in the States was not in existence in the Province of Ontario at the time of its creation.

I support the above statement in the following conclusions:

1. Power as applied in Ontario from the governmentally owned and controlled system in associate relationship with the Hydro-Electric Power Commission to be superior in kind to that supplied by the privately owned electric utilities of the United States must be more adequate, more reliable and cheaper. The facts show, however, that the electric utilities of the States hold more power in reserve and sell more energy per capita served; that by that token they can claim a greater reliability of supply and that the supply is cheaper to the consumer.

2. At the end of the fiscal year 1920, out of the total power-plant capacity operated by the Hydro-Electric Power Commission only 23 per cent was constructed by the Hydro-Electric Power Commission. The remainder represents plant capacity constructed at the initiative and risk of private investors, and in acquiring ownership of it such intangibles as franchise rights, good will and other intangibles were included in the purchase. This intangible cost, therefore, is represented in power "at cost." If a governmental plan of like characteristics to that of the Hydro-Electric Power Commission is to be inaugurated in the United States, it must include the purchase of or the contracting of power from existing utilities, and the same problem of including intangibles will be presented here.

3. The building of new power-plant facilities under the auspices of governmental ownership, as shown in the cases of Nipigon and Chippawa, both in respect to policy and cost, is not to the economic interest of the people.

4. The advocates of government or municipal ownership of electric utilities claim reduction in the cost of power in virtue of (a) elimination of taxes, (b) elimination of dividends, (c) elimination of high-salaried executives, (d) more economical wage and higher efficiency in labor scale.

With regard to (a), taxes are not eliminated. Just as much money in taxes is paid. The difference is in their distribution. In the case of private ownership, only the users of service pay the tax bill, while in the case of government-owned utilities all the people pay the bill.

With regard to (b), (c) and (d), notwithstanding dividends, high-salaried executives and the wage and labor claim, the answer is that, when the total operations are summed up, the people receive the power at less cost through private ownership under regulation.

5. The investment of capital in electric utilities under private interest control is far better protected from extravagance than when that capital is governmentally owned, for the reason that plans and estimates for such capital expenditures not only must gain the approval of a trained engineering and managerial staff and an experienced board of directors of the companies, but it also must have the critical review of the banker and the private financial investor. In the case of government-owned utilities the directing heads are seldom specifically trained in the business under their jurisdiction, and value of securities is not based upon the value of the property or the efficiency of management, but upon the taxing power of the government.

Arms, legs and body are useless without the head. A high-salaried executive usually saves many times (his salary included) the losses incurred by the cheaper and less efficient executive. Accomplishment by individuals in control of private enterprise is under keener observation than is the case when those in charge are governmental or municipal officers.

6. Governmental ownership eliminates all incentive for gain and throttles initiative. This is evidenced by the far greater growth of privately owned utilities.

7. The Hydro-Electric Power Commission is the judge of its own acts. A commission cannot fairly be the judge of its own (and others') rights in contentions.

8. Honesty of purpose does not necessarily reduce the power bill. The structure under which it is administered counts just as much—so far as the price is concerned.

9. The American companies in the Niagara district are supplemented by steam power far more than those on the Canadian side, and yet on the American side power is being furnished at less cost to the people.

10. The commissions of the States fully realize that protection to the people lies in protection to the electric utilities from which they are receiving power. The authority delegated to them to regulate rates, and the constitutionality of the law standing behind any action on their part or on the part of the electric utilities, provides a structure constructively balanced to do justice to all parties.

How to Organize and Conduct a "Home Electric"

A Detailed Plan to Guide the Selection of the House and Its Furnishing, Equipment and Operation, Based on the Experience Gained by the Successful Carrying on of Three Such Homes in Cleveland

By J. E. NORTH
Commercial Agent Cleveland Electric Illuminating Company, Chairman Electrical League of Cleveland

THE MOST CONVINCING ARGUMENT POSSIBLE FOR THE HOME ELECTRIC IS THAT THE PEOPLE COME AND SEE. NEARLY 35,000 VISITED THIS HOME IN CLEVELAND, BECAUSE THEY WANTED TO KNOW MORE ABOUT MODERN ELECTRIC COMFORT

UNDOUBTEDLY the "home electric" idea has at last sold itself to the electrical men of America. There have been "home electric" demonstrations for many years and in many cities, and so far as I know they have all of them been successful measures of educational publicity. But the idea took hold slowly and much time has passed. Today, however, there seems to be a well-formed wave of interest sweeping across the country, and we are continually hearing of some new "home electric" demonstration, the good news coming from New England, the Atlantic States, the South, the Middle West, the Rockies and the Pacific Coast. It has become a national movement and great benefit will result from it, because every "home electric" gives a fundamental education in the uses of electrical appliances in the modern home which is of more influence as a selling force than years of ordinary advertising and canvassing from door to door.

Last year in Cleveland three "home electric" demonstrations were organized under the management of the Cleveland Electrical League. Out of these three homes came experience and data that will prove invaluable to us in the organization of the fourth "modern electrical home," which we plan to open this June. I have felt, therefore, that it might be of very definite benefit to other cities where similar exhibitions are in prospect to resolve this experience into the form of scheduled recommendations that will give some guidance as to how to conduct a "home electric." These suggestions are offered, not with the idea of setting up our solution of this problem as perfect, but merely in the hope that they may be helpful, as they are based on actual experience and careful deductions from it.

Our three "homes electric" were features in a larger program of co-operative electrical development for which a fund of $68,000 had been subscribed by the electrical interests of Cleveland. It embraced also a school of salesmen, a scholarship contest based on a course of study in electricity and its uses, an industrial lighting exhibit, a commercial lighting demonstration and a broad program of educational publicity. The project for each of the homes was developed in co-operation with a builder, and we selected our locations, picked our property, planned our homes, built them and furnished and equipped them complete through the co-operation of local merchants, organizing and conducting each demonstration entirely under the direction of our own committee.

Of course, no orders were taken and nothing was sold. We were selling an idea only. Yet a large accumulation of evidence gave convincing proof of the great value of the tremendous opportunity to demonstrate thoroughly the convenience of electrical household equipment to so many people. The educational influence, we know, has been far-reaching and has led to the building and selling of many homes with up-to-date installations, the wiring of many convenience outlets and the sale of large numbers of appliances. And such is the history of every similar enterprise. Out of this experience I have drawn up the following suggestions

as a plan for the organization and operation of a "home electric," and I believe that they will apply in almost every community.

HOW TO PUT ON A HOME ELECTRIC

1. *Time of Year for Exhibit.*—May or June is the most desirable time. People at that season are just getting away from the fireside and are most responsive to oppor-

$50,000.00

For

Cleveland Electrical Development Campaign Fund

$_____ Cleveland, Ohio, _____ 1920

The Electrical League of Cleveland Co.,
Statler Hotel, Cleveland, Ohio

In consideration of the efforts and work of the directors and Members Council of The Electrical League of Cleveland Company, and their constructive plans to raise a fund for future work, and in further consideration of the mutual promises and agreements of other subscribers to this fund, I, (we) do hereby subscribe and promise to pay to the Treasurer of said The Electrical League of Cleveland Company, the sum of $_____, payable as follows:-

25% of the above amount or $_____ this date.
25% " " " " " $ Jan. 1st, 1921.
25% " " " " " $ April 1st, 1921.
25% " " " " " $ July 1st, 1921.

The objects, purposes and conditions of this agreement are that the full amount subscribed and paid in will be used in connection with the work of the Members Council of the League, and that the subscription hereunder shall be binding and payable when the aggregate of the subscriptions hereto shall on or before November 15, 1920, amount to the sum of at least $10,000.00. If for any reason the directors of the League should find it advisable to discontinue the work of the Council, it is understood that the unexpended portion of the amount paid on this subscription shall be refunded to the undersigned subscriber.

Rec'd payment (Check $_____ Cash $_____)
Subscriber _____
By _____
Address _____
By _____
City _____
Secured by _____
Telephone _____

THIS FORM OF CONTRACT WAS USED BY THE ELECTRICAL LEAGUE OF CLEVELAND IN FINANCING THE CO-OPERATIVE HOME ELECTRIC PROJECT

tunities for diversion. September would be third choice of months, when attendance would be the least affected by the weather.

2. *Sponsoring the Movement.*—The object being educational in nature, care should be taken not to give it a commercial aspect; consequently the movement should be sponsored by an electrical league or club and not by any individual sales organization. If need be, form a league, club or electrical information society.

3. *Forming Committee.*—The chairman should be a man who has ability and enthusiasm and can devote the time necessary to check up every detail. It is suggested that the committee include one representative each from the central-station company, the manufacturer (wiring devices), the jobber, the residence wiring contractor, the lighting-fixture dealer, the furniture dealer, the builder and one man to handle publicity and advertising.

4. *Electrical Home Fund.*—After estimates have been made and a budget set up it should be agreed by all concerned with the project that a thing worth doing is worth doing right. Absolute control of the exhibit must be held by the electrical group; otherwise the so-called electrical home exhibit may turn out to be a furniture show, a builders' show, an art museum, or something other than originally planned. Be sure to hold control, and the best way is for the electrical interests to put up most of the money. The three homes in Cleveland were financed by electrical men, no outside interests having been asked to contribute to the fund. Contributions to the general fund were made by the following groups in the percentage indicated: Central-station company, 33.22; jobbers, 23.91; manufacturers, 22.44; lighting fixture dealers, 5.82; industrial and commercial contractors, 5.74; appliance dealers, 5.33; residence wiring contractors, 3.46. It is a wise plan to have the money in the bank before obligations are contracted.

5. *Subscription Agreement.*—The accompanying form of contract was used to secure subscriptions to a general fund of $50,000, in which the electrical home budget was included.

6. *Selecting Builder.*—If possible, arrange with a liberal advertiser to build the home, one who will agree to spend more than usual for wiring and fixtures and who understands that a few dollars will have to be spent in retouching after the exhibit. I did not inquire about this item of expense with the second and third homes, but with the first home the builder's total expense for cleaning spots from walls and revarnishing floors was $59.

The builder should be one who appreciates the first opportunity of its kind in the city for a home builder to put across his ideas in building to thousands of people who otherwise would never inspect one of the homes which he builds. He must give his full co-operation and turn the house over to the committee without rules and regulations governing the exhibit, demonstrators and visitors.

7. *The Furniture Dealer.*—Select a "live" one that sells moderate-priced furniture—one willing to furnish the home from basement to attic and include floor covering, curtains, draperies, bedspreads, everything. None of the furnishings should be very elaborate and novelties should be discouraged.

The furniture dealer who furnished our homes used plain but good furniture. The curtains and draperies were made of good material that harmonized with the home. In the second home draperies had a retail value of $1,400 and were made to order, the dealer taking a chance on selling them with the home. We were obliged to remove a handmade bedspread because at times it was the only thing in the room that attracted attention. No other exhibits, such as paintings or anything that will detract from the electrical features, should be permitted.

8. *The Location of Home.*—When considering the location of the home, it is better to select a builder whose principal business is to build and sell houses, rather than a real-estate dealer and builder. Our homes No. 1 and No. 3 were built on the only vacant lot on the street, and No. 2 was almost entirely surrounded by houses, some of which had been completed for many years.

The home should be accessible and on the street most used by automobilists. In these days it need not be on a car-line street. However, it is preferable to have it convenient to the car line. If possible, avoid the undeveloped "new addition" in choosing a site. We assisted in the selection of a site by visiting a number of vacant lots pre-

Name S. C. Trewn
Address 667 E 128 St No. 34393
Phone No. Eddy 657 J

Each of the following questions must be answered YES or NO

Do you own house in which you live	Yes	Do you own the following electrical appliances:	
Is house wired	Yes	Electric Range	No
Do you plan building	No	Electric Dish Washer	No
Give number in answer to following questions:		Electric Refrigerator	No
How many rooms in your home	10	Electric Clothes Washer	Yes
How many convenience or baseboard outlets in your home	4	Electric Ironer Machine	No
		Electric Sewing Machine	No
		Electric Vacuum Cleaner	Yes

THIS REGISTRATION CARD WAS USED IN CLEVELAND AND PROVIDED AN EXCEEDINGLY VALUABLE SURVEY OF HOUSEHOLD CONDITIONS

viously inspected by the builder. The builder then purchased the lot agreed upon as the most desirable.

9. *Kind of Lot on Which to Build.*—The lot should have width enough to allow a reasonable amount of space on each side. The depth should permit building the front line of the house at least 40 ft. from the sidewalk. Then, with floodlamps in front and color from the shades in the interior, the appeal of the house is seemingly irresistible.

10. *Value of Home.*—All classes of people are interested in the more elaborate high-priced home. Out-of-the-ordinary architecture adds to the attractiveness. Columns and what some called "gingerbread architecture" on our most expensive home ($48,000) made it the most desirable show house.

When our modern electric home campaign was planned we were of the opinion that the inexpensive wage-earner type of home should be chosen for the display. We are now agreed that the wage earner will visit the high-priced home for the suggestions it offers, and he learns that many of the things on display are within his reach; but the same person has not the same curiosity or interest in the home of the type in which he is accustomed to live.

11. *Architect's Plans.*—When plans are submitted they should be carefully considered, perhaps first by the furniture-dealer member of the committee to make sure that the best possible provisions have been made to accommodate the furniture. The same care must be exercised to provide suitable places for some of the electrical appliances.

The route which visitors are to take should be considered. Perhaps arrangements for connecting doors or omission of closet partitions will facilitate the handling of visiting groups. After the location of all furniture and equipment has been agreed upon, then the outlets can be located and specifications prepared.

THE THREE "MODERN ELECTRIC HOMES" EXHIBITED IN CLEVELAND LAST YEAR. THE HOUSE AT THE LEFT WAS NO. 1, THE UPPER HOUSE WAS NO. 2 AND THE ONE AT THE RIGHT WAS THE THIRD. EACH HOUSE WAS SOLD DURING THE DEMONSTRATION

12. *Wiring the Home.*—All residence-wiring contractors who assist in financing the electric home exhibit should be permitted to bid on wiring. In our case bids were asked from the members of the Residence Wiring Association, and although each contract was awarded to the lowest bidder, the sign on the exterior read "Wired by the Residence Wiring Association of Cleveland."

At the time wiring is being installed the committee should visit the home to check the outlets as specified in the plans. Frequently it is found advisable to move an outlet or add one that has been unintentionally omitted.

13. *Selecting Lighting Fixtures.*—Fixtures can be best selected by a committee composed of a lighting fixture dealer, a builder and a furniture dealer. The committee should agree upon design of fixture, glassware, shades and size of lamps to be used and then draw up specifications for fixtures as found best. These may be furnished by a few or by a drawing of rooms. All fixture dealers may have a chance to install one or more fixtures.

In Cleveland a committee from the Lighting Fixture Dealers' Society selected designs and presented them to the electrical home committee for approval. Then orders were placed with local lighting-fixture manufacturers. Lighting-fixture glassware was distributed among glassware manufacturers.

14. *Selecting Appliances.*—The assortment of appliances to be displayed should be determined by the committee, then a questionnaire mailed to each contributor to the fund who might be able to supply one or more of the appliances, the names of all appliances which will be loaned for the exhibit to be filled in by the contributor and the questionnaire returned to the committee. Cards can then be used to list each make of appliance, and from these each appliance can be selected by drawing any number within the limits of the total number of makes listed. A public drawing eliminates complaints.

15. *Demonstrators.*—If possible, employ special demonstrators who can be made to understand the object of "selling" the public as regards the use of the things on display and not the particular make of articles in the exhibit. It is my opinion that this is the only way to guarantee harmony during and after the exhibit. At least five demonstrators should be provided, one each for living room, dining room, kitchen, bedroom and laundry. All of the bedroom and bathroom appliances, as well as the sewing machine, can be displayed and explained from one bedroom. It is preferable, however, to divide these articles and add another demonstrator to work in the second bedroom.

At the opening of the first home we were of the opinion that only demonstrators with electrical experience could be used. Later we employed two very capable girls and had no difficulty in training them to lecture on and demonstrate equipment in certain rooms. I think, if necessary, inexperienced help can be used in every room, except possibly the kitchen and laundry.

Electrical home organization required: Five or six special demonstrators; one doorman to receive visitors and have full charge of home; one night watchman who will do porter work; one maid.

16. *Electrical Energy.*—An estimate must be made on this item unless no charge is to be made.

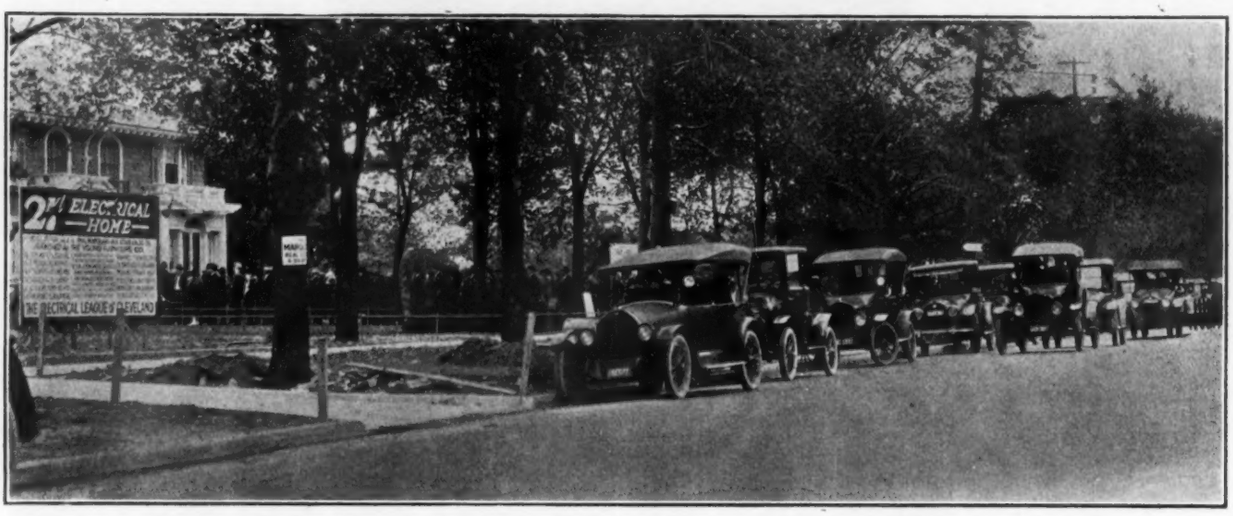
17. *Miscellaneous Items of Expense.*—Lamps, cleaning supplies, brooms, mops, bathroom supplies, fire and liability insurance, must be provided.

18. *Registration Cards.*—We used 3-in. x 5-in. registration cards at the second and third homes. The lucky name was drawn at 10 p.m. each night, and the prize awarded was either a flatiron, a radiant heater or some inexpensive appliance. About 85 per cent of the visitors filled out cards on which we asked for various information.

The registration counter should be in the basement. Pencils should be provided, attached to strings. A box for the cards should be conveniently located. Modern electric home booklets and registration cards can be explained and given out by the laundry demonstrator. Booklets or cards when given out at the front entrance cause visitors to pay less attention to lectures and exhibits.

19. *Hours Open to the Public.*—Our first home was open from 10 a.m. to 10 p.m. With the second and third homes the hours were changed from 1 p.m. to 10 p.m. We do not think that the attendance was affected by the change, and with the latter plan there was less difficulty in arranging a schedule for the persons employed at the home. Half of the demonstrators were off for dinner from 4 p.m. to 5:30 p.m. and half from 5:30 p.m. to 7 p.m. Each female demonstrator was given one afternoon off from 1 to 5:30 o'clock to reduce her time to the hours permitted by state law.

20. *Handling Visitors.*—Lectures that can be given in from three to five minutes should be prepared and demonstrators trained in advance of the opening date. Throughout the period of operation there will be slack hours and



A TYPICAL SCENE DURING THE SECOND HOME ELECTRIC IN CLEVELAND, WHEN AN AVERAGE OF 1,199 PEOPLE VISITED THE DEMONSTRATION DAILY FOR FOUR WEEKS

busy hours. For the slack hours a five-minute, or possibly a ten-minute, schedule can be arranged.

For example, during the slack hours visitors can be seated in the living room until time for the next lecture to start; then the group can be passed on in a systematic way through each room, unless, however, the number in waiting reaches, say, fifteen people. Then the lecture should be started at once and new arrivals held at the front entrance until the living-room lecture is completed and that group has passed on to the next room. To explain our method of handling visitors, I will outline a trip through house No. 2:

Lecture No. 1: In living room, on lighting the home, portable lamps, the importance of convenience outlets, electric piano, talking machine, electric logs, fan on hanger.

Group was then passed through sun room and back through living room, then upstairs, where it was directed to bedroom No. 1. No lecture was given in this room. After inspecting this room the group was then directed to bedroom No. 2.

Lecture No. 2. In bedroom No. 2, on heating pad, blanket, vibrator, violet ray, sewing machine, radiant heater, bed and dresser lighting brackets, "elexits" and convenience outlets. Group was then passed on to bedroom No. 3.

Lecture No. 3: In bedroom No. 3, on master switch, curling iron, hair dryer, vacuum cleaner, milk warmer, "elexits" and convenience outlets. Group was then directed to bedroom No. 4, which was furnished for inspection.

During the busy periods every evening and Sunday afternoons the groups on the second floor were directed by a man in the upstairs hall. On signal from the man at the front door, group in bedroom No. 4 was directed to dining room.

Lecture No. 4: In dining room, on lighting fixture, teapot, coffee percolator, toaster, egg boiler, fan on hanger, floor outlet, candlesticks on buffet and convenience outlets in wall, 36 in. above floor for convenience in connecting heating appliances and vacuum cleaner. Demonstrator then called attention to triple receptacle at level of breakfast table, the waffle iron and grill, which was inspected as group passed through the breakfast room to kitchen.

Lecture No. 5: In kitchen, on range, dishwasher, power table, refrigerator, water-heater switch, flatiron and pilot lamp. Group was then directed to basement.

Lecture No. 6: In basement, on refrigerator equipment, clothes washer, centrifugal dryer, electric air dryer, ironing machine, water heater, ice-cream freezer, bell-ringing transformer, furnace regulator, stationary vacuum cleaner and foundation meter box. After this lecture announcement was made concerning electric home booklets and registration cards. After registering and depositing cards in box, visitors passed out the back door to the garage, which should be used to exhibit electric pleasure vehicle and garage lighting and equipment. We did not avail ourselves of this opportunity.

At this home the builder set up an office on the back porch, and all inquiries made to demonstrators were referred to his representative, whom each visitor was obliged to pass after leaving from the back door. Demonstrators should not be permitted to participate in sale of house.

Naturally one of the first questions in connection with any project is concerning the cost; therefore I would suggest that a budget be prepared after making estimates on the following items of expense:

21. *Newspaper Space.*—

	Inches Morning Paper	Inches Evening Paper
Second day prior to opening	75 (five col., 15-in.)	75
First day prior to opening	75 (five col., 15-in.)	75
Day of opening	75 (five-col., 15-in.)	75
Second day	20	..
Third day	..	20

and 20 in. every other day in each paper during exhibit.

22. *Booklets* — Original order should be on basis of 5 per cent of the population, giving one booklet to each family—printer to hold form in the event that more copies should be needed. We distributed 43,800 sixteen-page booklets, only for visitors at the homes. Booklets will cost from 4 cents to 6 cents each, depending upon amount of art work, stock and quantity.

23. *Special Invitations or Announcement Cards.*—Make estimate on basis of 100 for each electrical firm in city, these to be inclosed with statements, letters, etc.

24. *Special Letters.*—These should be sent to each architect, builder, general contractor and real estate man in the city. Another form of special letter should be sent to the president of each woman's club, specifying the date on which members are invited to be guests at the electrical home. From one to three clubs, if necessary, can be invited for the same day. Announcement cards can be inclosed with letter.

25. *Exterior Illumination.*—Not fewer than four floodlamps should be used to illuminate house front and rear.

26. *Arrows.*—A hundred arrows, 3 ft. long, 8 in. wide, ¾ in. thick, painted with white background and red letters, "To the Modern Electric Home," should be provided and placed on poles 8 ft. from ground on all principal streets near and leading to the home. These will cost from 50 cents to $1 each.

27. *Auto Signals.*—Special waterproof signs may be provided for all automobiles and trucks owned by electrical men, and by the builder and the furniture dealer who furnishes the home. These may merely announce the opening dates of homes.

28. *Billboards.*—Use of billboards is not advised unless locations are the most desirable in the city.

29. *Street-Car Cards.* — Inside cards are not advisable. Car cards should be used if space on front or back of car can be secured.

30. *Window Cards.*—In large city, *no;* in small city, *yes,* provided that card which has been prepared for some other use can be used in windows.

31. *Special Publicity Stunts.*—(a) Christening home on opening date. Contest can be conducted prior to opening. High-school students to vote for the most popular girl to christen home. Most newspapers will conduct contest of this kind gratis. Award prize to girl. (b) Flag raising on opening date by most popular club woman. (c) Arrange for some popular motion-picture actress or some noted person to visit home.

32. *Co-operative Advertising.* — Arrange with all electrical advertisers to give space to the electrical home in connection with their advertising. If possible, have the builder and furniture dealer put all that they would spend for advertising in the general publicity fund and give credit to each in all advertisements.

33. *Cost and Attendance (Cleveland).*—

	Value of Homes	Date Opened	Days Open	When Sold	Number of Visitors
Home No. 1.....	$37,000	May 15	32	Fourth week	34,354
Home No. 2.....	48,000	Sept. 11	29	Second week	34,790
Home No. 3.....	17,000	Oct. 13	29	Second week	13,965

Record of visitors by man at front door with hand counter; attendance at third home affected by location, kind of house, and 10 days rain or snow.

34. *Cost of Wiring and Fixtures (Cleveland).*—

	Cost of Wiring	Per Cent of Home Cost	Cost of Fixtures	Per Cent of Home Cost	Total Cost Wiring and Fixtures	Per Cent of Home Cost
Home No. 1.....	$654	1.96	$759	2.28	$1,413	4.24
Home No. 2.....	800	1.85	618	1.43	1,418	3.28
Home No. 3.....	425	2.77	350	2.28	775	5.00

Average wiring cost per outlet: No. 1, $5.50; No. 2, $5.67; No. 3, $5.52.

Calculations made on basis of home cost being 90 per cent of selling price.

35. *Total Expense and Net Cost per Visitor (Cleveland).*—

	Net Expense	Cost per Capita*		Net Cost per Visitor
Home No. 1.....	$6,718.07	$0.0074		$0.19
Home No. 2.....	5,048.33	0.0056		0.14
Home No. 3.....	2,928.61	0.0032		0.20
Total.....	$14,695.01	$0.0162	Average	$0.176

* Population of Greater Cleveland, 900,000.

36. *Comparison of Costs for Visitors to Electrical Home and Electrical Show (Cleveland).*—Average of $0.176 per visitor to electric homes. Electric show 1920, gross cost per visitor, $1.52. This does not include gratis car card space for 1,200 cards, three 40-ft. illuminated boards, one electric sign on public square, or gratis newspaper space, the value of which has not been calculated.

Some Thoughts on Standardization

The Evolution of Electrical Standards—The Spirit that Has Made Them Creative and Progressive Rather than Restrictive —The Future Need in the Effort for Still Fuller Service

BY E. W. RICE, JR.
President General Electric Company

FROM the beginning electrical work has been naturally attractive to the bold spirit of youth. Its leaders without exception were mere youngsters or relatively young men. Whatever standards or rules were found necessary or thought desirable for the industry were made by these young men, grown a little older, aided by a countless host of other young spirits, better trained in formal science but no more enthusiastic than the early pioneers.

I think we have here the reason why these rules or standards have not cramped and paralyzed the industry, but have rather aided it. They were made by those who were busily engaged in developing the same industry. Care was taken that the rules should guide development, not restrict it. The standards were made by those who were to obey them; they were made by, with and for the benefit of those who had created and were using the products of our great scientific industry. This, I submit, is as it should be, and I firmly believe that any other method would have been unfortunate, if not disastrous.

Our industry is more firmly based upon science perhaps than any other, and electricity could not have become the important branch of scientific endeavor which it is today without the early work of those greatest of all standardizing committees, the international electrical committees, which between 1893 and 1900, at different places, determined and defined our fundamental and practical electrical units—the ohm, volt, ampere, watt, henry, coulomb and others; so that all those engaged in electrical work think and talk the same language. We suffer no such handicap as has existed in other fields, such as is imposed, for example, by the different monetary units and the variety of standards of weights and measures, with the resultant waste of time and energy.

In the beginning of our industry, back in the eighties of the last century, there was, of course, no need for commercial standards as no industry existed. It is interesting, however, to remember that very soon after the electric arclight began to be used for commercial purposes the need of a standard current for the series arc circuit was felt. Early in 1881 9.6 amp. was selected by Prof. Elihu Thomson of the Thomson-Houston Company, and this continued to be the standard of the industry for many years. Edison also adopted about the same time a standard of 110 volts for his incandescent lamp. I am informed that a committee of the Power Club in co-operation with a committee of the National Electric Light Association has adopted stand-

ards which in the case of transformers have effected large reductions in the number of listed specialties, odd rates, voltages and sizes. The elimination of such apparently useless variations has been estimated at between 50 per cent and 60 per cent of the total listed units. Such action must increase the effectiveness of the engineering and sales personnel and improve the quality and reduce the cost of the service rendered by the manufacturing companies to their customers and to the public.

NEED FOR STANDARD PLUGS

Naturally, I am an enthusiastic user of the many electrical devices which have been developed in recent years, such as percolators, fan motors, vacuum cleaners and toasters; but as these various devices were introduced into my home I found that each one required the use of a different type of attachment plug. Each different plug represented, I was informed, a great advance in the art. Unfortunately, the new plugs did not fit any of the types of wall receptacles already installed in the house. I understand that the Associated Manufacturers of Electrical Supplies have co-operated in the standardization of the attachment plug and wall receptacle now known as "convenience outlet," and this work of standardization has my profound respect. It will add to my comfort and peace of mind in my declining years.

It is gratifying to note that it has been fully recognized by our manufacturing organizations that in many instances the field of standardization is so broad that co-operation with other organizations and societies is necessary and that a spirit of good sense and friendly co-operation has been displayed in all such cases. I trust, however, that no one will imagine that because I am stressing the value of standardization I am not alive to the necessity and desirability of progress and to the fact that this involves increasing complexity. I believe it is essential to guard and preserve individuality. Variety is still the spice of life. Electricity has made its enormous progress because of its ability to meet the infinitely varying conditions of our industrial, city and home life. It can transport matter, transmit thought and transfer energy in its most useful form with maximum economy and almost without limitation. New methods, new ideas, new devices are therefore to be encouraged and are the life-breath of our industry.

However, variety which is the result of haphazard methods of growth, variety based upon ignorance or prejudice, or which merely exists for the sake of itself, is of doubtful economical value at best and may easily become a source of great economic loss. It is a useless by-product of our advancing industry.

INFLUENCE ON COSTS

I think it is obvious that we of the electrical manufacturing industry and those we serve have not obtained the benefit which should follow the increased volume of our business, for the reason that the variety of sizes and the number of different units have increased generally more rapidly than either the increase in total number of units or the volume of business measured in dollars. The inevitable result has been to increase the "overhead," or the cost, not only of manufacture, but of distribution of the units of industry. I believe that if our industry is to continue to grow and increase its service to the public as it could and should, our costs must be reduced. I am sure that we shall all agree that if the number of separate units could be reduced, the total cost of production and distribution would be materially lowered. This would redound to the benefit not only of the manufacturers, large and small, but of all those connected with the distribution of our product and be of equal benefit to our real employers, the public. I believe that a large reduction in the number of sizes and varieties can be made, not only without sacrifice of real service to the public, but with an increase in the value and improvement in the character of our service. It cannot be done by any manufacturer alone; it can only be brought about through the co-operation of all interested parties.

Full success will require a sympathetic attitude on the part of our governmental authorities at Washington, which apparently now happily exists. All these organizations of ours have a great opportunity and an equal responsibility. Splendid work has already been done, but we should, in my judgment, patiently but vigorously continue the work to the end that our profession and business may render that full service to man which we all visualize, but which so far with all its importance is but a promise of a greater and more useful future.

Development of Austrian Water Powers

SINCE the end of the world war stress has been laid on the fact that exploitation of her water powers is a vital necessity to Austria, with her new restricted frontiers. It has taken about three and a half years to find a way in which to start this large and useful task in earnest. It was necessary to clear up the legal position as regards water power, to pass bills with a view to specially favorable treatment regarding taxation and to draw general and detailed plans. This preliminary work in a region which previously had been neglected has involved much time, trouble and expense, especially as certain interests at variance with each other had first to be reconciled. It appears that all difficulties to the development of the water powers of Austria have now been removed. The most important question is, perhaps, that of financing, and even this question may now be considered as solved. The progressive depreciation of money has made it impossible to take the direct routes heretofore known, and new methods had to be found by which investing capitalists were offered complete security against further depreciation.

The most important water powers in Austria are in the Province of Styria. The immediate development of the water powers of this province is planned. Styria has reserved to itself all rights of granting concessions and has combined all important water-power concessions resembling a monopoly in a limited company in which the province itself is a shareholder. It appears that the present plan is that a combined working of all valuable water powers shall be arranged in such a manner that plants on rivers the flow of which varies considerably shall be supplemented by storage plants in the mountains and by steam plants in brown-coal pits. The plants, united under one control, are to average their output by high-tension mains and in this manner put to profit all the energy which it is possible to extract from the water powers. The total concessions to be exploited provide for 450,000 hp., which is about one-fifth of all the water powers in Austria possible of development. The entire project is to be finished in fifteen years.

Legal Phases of Inductive Interference

Definition of Mutual Responsibilities of Power and Signal Systems Must Be Developed—Present Legal Status Confused Because Few Decisions Have Been Made on Broad Fundamental Principles

THERE are certain legal aspects of the inductive-interference problem that must be definitely analyzed and formulated. This statement does not mean that answers to the questions involved must be obtained through court and commission action. Such a course is one of the ways, but the process would be a long and expensive one. Public resentment would be aroused at many stages, and in the end it is doubtful whether the result would be satisfactory to any one. The shorter and easier course would be recognition by the interested parties of certain fundamental propositions that must eventually appear in legal form and a mutual working out of the details of the problem. Either through the course of legislation or the example of consistent practice, the establishment of fundamental considerations should be allowed to come about in a logical and natural way. It is the aim in what follows to state some of these fundamentals without in any way placing the responsibility therefor, except the responsibiity that none can escape, which is the duty so to conduct the electrical industry that the fullest service is rendered to the greatest number and that the industry itself may develop along those lines that best meet the needs of the public from both the physical and the economical viewpoint.

NATURE OF SYSTEMS INVOLVED

Broadly, two systems, which may be classed as power and signal systems, are involved. The operations of both are based on the same fundamental principles, and the manifestations of energy that cause the so-called inductive-interference problem are not confined to circuits of either system, but can be found within either system or between circuits of the two groups. Underlying the specific problem that has become known by the name of inductive interference are certain inherent tendencies that need to be thoroughly realized. They are not peculiar to either system. These tendencies may be stated as follows:

1. A signal circuit, including its connected apparatus, is inherently a sensitive one, operating with minute current and energy values. It is sensitive in varying degrees, with harmful results, to inductive influences either from paralleling signal circuits of the same or different character or from power circuits which it parallels. The character of construction and operating methods used within the signal system can accentuate or decrease sensitiveness to the inductive influence of paralleling circuits.

2. A power circuit is not sensitive to harmful interference caused by induction from paralleling circuits of any nature. It exercises an inductive influence on paralleling circuits that can be accentuated or decreased by the character of construction or operating methods within the power system itself.

Except for the matter of sensitivity to inductive influence that creates harmful effects, the two statements can be reversed, viz., the signal circuit exercises inductive influence on a paralleling power circuit and the power circuit responds to that influence. Fundamentally, therefore, the inductive relations of the two classes of service are the same, the difference between the two lying in the effect on the service rendered by each.

One question to which the answer must finally assume a legal form deals with the extent to which either system can go in its development without respect to the presence of the other. Left to develop without consideration for any other system, a signal system could progress in any way that it might choose. Sensitivity could be increased as far as the physical limits of apparatus would permit. Use of the ground-return system in important service would be governed by good practice in communication engineering, and the protection against inductive effects would be only that necessary to prevent induction between signal circuits themselves, because there would be no other systems to consider.

On the other hand, the power system, left to itself, might be able to use the ground-return system of power distribution, subject only to the limits imposed by public safety and the electrical limits of such transmission. When forced to operate in close proximity to circuits of other systems, the question at once arises of how far either can go in developments that may make its own service cheaper but with the possible or probable result of interference with the service of the other, either by inviting interference on its own circuits and compelling the other to limit its service or by employing construction and operating methods that increase inductive influence and therefore limit the service of the other. A legal limit on the extent to which either can go along certain lines of development must be established and a clear mutual responsibility placed on each that will give the public the greatest possible service.

USE OF THE HIGHWAYS

Limitations along some lines of development as indicated above are a fundamental part of highway problems. Highways were originally established to facilitate travel. In perhaps the majority of cases the highways have been dedicated by adjoining property owners for travel uses. If such use is at any time abandoned, the land in many cases reverts to the property from which it originally came. Public utilities have had the use of the highways, subject to the prior rights of the public for travel purposes, because of the greater possibility of service that such use has created. The public is, therefore, a third party that must be considered, whose rights seem to be such that the signal and power systems must adjust their operations to meet the prior claims of this third party. The claim of priority of occupancy of the highways has been raised by signal interests, and in some cases efforts have been made to forbid a power company the occupancy of a highway on the ground that it would seriously impair if not destroy the service of the prior occupant. In other cases pleas for separation have been made on a basis that would give the older company the complete

monopoly of at least some of the highways. The particular claim, if established, would apply equally to cases where power lines were on the highway first, and could have the effect of barring signal lines from the highway if improper power-line construction and operating methods were used. The questions that must finally receive legal answers, therefore, involve the rights and duties of power and signal companies that occupy the highways. What must each do within its own system to limit sensitivity to or a tendency to exercise inductive influence? What burden, if any, can the first occupant place on a later comer by reason of prior occupancy, and can the burden be carried so far as to prevent service of any but one type to the public which originally gave the highways for public use? And, finally, what mutual responsibilities exist for the working out of co-ordinated control of the forces involved?

If it were desired to invite inductive troubles, the ground-return signal system would be perhaps as good a plan as could be devised. On the other hand, the alternating-current power distribution system in which one wire and the earth are used as the circuit for supplying customers is an equally efficient producer of inductive influence on other circuits. Inherently the character of either circuit is such that few practical and effective methods can be adopted to limit sensitivity to or a tendency to cause inductive interference. Certain types of signal circuits that make extensive use of the ground return as a standard of construction are of a character that is less sensitive to inductive troubles from neighboring circuits than are the telephone circuits from which the larger part of the difficulty from inductive troubles has arisen. It may therefore be necessary in the final analysis to make some separation between these two types. The separation will probably be necessary more from a technical viewpoint than from a legal one.

Differences of Degree and Specific Remedies

The differences in inductive troubles are those of degree and specific remedies needed. They are not differences in the fundamental principles on which the circuits are designed and operated. From a fundamental legal viewpoint the status of the ground-return circuit may possibly be the same regardless of the type of service. In the telephone field the most frequent questions arise with rural lines. Generally these are in bad physical condition, which accentuates the inductive troubles both as between circuits of the same character and power circuits. A number of cases have come before courts and before commissions in which the owners have sought to throw the burden of remedies on the later comer in the field who has aimed to give power service.

The other types of ground-return signal circuits are generally in the hands of utility companies which keep them up to as high an average of physical condition as any utility properties display. The legal issues likely to arise are therefore two in number. The first will be in connection with those circuits that at best are most sensitive to inductive troubles, are in poor condition physically and have plants poorly designed even in their prime. The argument for such systems is that, though they may be poor from the standpoint of the best practice in the art, they are the best that the consumers can afford and must have protection against interference. The same argument has been advanced to a limited extent for the ground-return power line. If the argument holds for one, it naturally must for the other, and it is easy to imagine that the result in any specific situation would be the establishment of one service and the barring of the other. The practical effect of establishing this form of protection would be monopolization of the highways in specific cases by one service against the other. Such a situation could not exist for long, and sooner or later some definition of the responsibilities of the owners of such construction must be established.

The second legal issue that will develop from the other class of signal circuits will be their right to existence on the ground that they are well maintained and have been in satisfactory use for a long period of years. While inherently they are sensitive in a certain degree to inductive disturbances from paralleling circuits, which canot be prevented because of the character of the signal circuits, the claim will be that they are entitled to protection even at the expense of barring other classes of service. The standing of the ground-return power line will eventually be the same as that of signal lines of the same type.

The Present Legal Status

The issues mentioned are by no means all. An interminable list could be drawn out, but on careful analysis it is believed they all could be traced back as "relatives" of these few fundamental issues. A study of present legal decisions reveals opinions that can support almost any contention that it is possible to make. This is because the cases have presented only a part of the issues and few decisions have been made on broad fundamental principles. It is impossible to say at the moment that any of the main issues have attained standing on a firm legal basis that leaves no doubt as to the answer. It is not probable that such a position will ever be attained on the question in its entirety. As the problem grows older more and more stability will be reached. A fundamental principle of our system of law is that property cannot be taken without due process and that compensation for losses must be returned. Another fundamental principle is that an individual may not use his property to the damage of his neighbor or the community. Many times the application of the first principle, if made in accord with the views of the owners, is in conflict with the rights of others, and in the succeeding adjustments the owner is, in his opinion, deprived of his property without due compensation. Legal decisions are never on the rights of the individual without consideration of his relationships to the community, and the application of the two principles of law enumerated above is never on an absolute basis. The result is an apparent shifting in principle that is in reality a shift in relative conditions affecting the individual. Legal decisions in such matters as this, in the development stage, are therefore shifting constantly as the problems develop and drift away from theoretical individual rights toward the needs of the community. In this particular situation the rights of two interests are involved, but those rights are modified by the right of the public to a service which in the final analysis is the only reason for the existence of the electrical industry.

The final answer to the legal phases of the problem, whether secured through the painful and expensive method of legal procedure or the more pleasant and immensely more profitable method of mutual agreement, will be the one that will give the public the greatest benefit of both services with the least possible interference to either.

Letters from Our Readers

This is a readers' forum. Comments on questions before the electrical industry presenting economic, financial, engineering or commercial aspects and new or supplementary viewpoints on published articles are cordially invited

Quick Success Must Not Be Expected in Electrical Industry

To the Editors of the ELECTRICAL WORLD:

I have read with interest your recent editorial comment on the dwindling number of students in electrical engineering. Having been in the profession for more than thirty years, keenly watching its development, I think I can suggest the reason. It is simply this, that the rewards have become on the average quite too meager to attract ambitious young men in the former numbers. When a science, art or business is in a period of very rapid growth not only does the demand for men outrun the supply, but, what is more important, there is a vastly greater opportunity for initiative to win success than exists at later stages. As the business becomes stabilized the individual tends to become a wheel in a well-ordered machine, highly useful but replaceable by a spare part within reach on short notice.

For the last twenty years there has been a rush to electrical engineering that has kept up remarkably well. The general scale of living has increased, but the pay of the young engineer has lagged behind. Nothing but very extraordinary ability or strong "pull" has saved him from sinking into a status of decent penury, even if he has been able to hold his job in the face of the slacking activity in the business. A surprising number of men out of work have recently come within my knowledge, showing that the employment lacks stability.

The grim truth is that, despite the immense possibilities in the electrical field, the chance for anything more than honorable poverty is uncomfortably small for the average young man just starting to follow his profession. The chap really in demand is he who can sell for $5 a two-dollar suit of underwear to a man who doesn't want it. Now and then one hears of comparatively recent technical graduates who are getting big salaries. However, it has been the writer's observation that the recipients have often followed a business quite remote from the profession for which they trained. For example, there are within my ken two very successful and highly respected undertakers, a vice-president of a manufacturing corcern, a treasurer of another, three or four well-paid salesmen and a couple of purchasing agents, all in fields wide of their professional training. The youngster has no longer a tolerable chance of jimmying an upper window of his chosen calling; he must climb the stairs.

The condition is much the same as that which has prevailed in civil engineering. A half century since, in the booming days of railway building, many a young engineer won fame and fortune, as fortunes then were, in a few years, and in that group are some of the great figures in the profession. Later on things settled down and the clever young graduate was lucky if ten years of hard work saw him assistant superintendent of waterworks of modest dimensions at the pay of a journeyman plumber. Similarly, the automobile business is settling down to the point where even a combination of skill and luck no longer brings the fortune assured a decade ago.

To reach such a condition a business does not have to cease growing, but merely to become somewhat stabilized and standardized, as is the electrical business of today. Therefore a young man who looks for quick success as the reward of earnest effort is less likely to find it here than in fields where the springs of progress are in boiling activity. For myself I have not advised any ambitious young man to go into electrical engineering for at least a decade. Probably some day the situation will change for the better; then the rush will be on.

LOUIS BELL,
Boston, Mass. Consulting Engineer.

No Ground for Fear

To the Editors of the ELECTRICAL WORLD:

I have read the annual summary of the reports on registration in electrical engineering in the colleges and your editorial comment thereon, both published in your issue of Feb. 11. You express the fear that the falling off in registration this year may indicate a want of appreciation on the part of young men of the opportunities open to them in the electrical field. I believe a close examination of the figures will show that they give no ground for this fear.

The present decrease in registration is obviously the normal reaction after the greatly stimulated college attendance following the war. The increases at that time were due to the return of young men from war duty, to the oncoming of the suspended wave of high-school output, and to the emphasis given by the war to the importance of technical training. The first two courses were abandoned and a reaction after them is natural. Some interruption, if not a setback, in the normal increase in registration might have been expected as a result of the war, but the figures appear to indicate that an actual gain rather than a setback has resulted, for the new registration of the present year still shows an increase of from 25 to 30 per cent over the last pre-war years.

In addition to this the figures indicate a remarkable growth in the attendance at electrical trade and vocational schools. There is no decrease this year over the registration of the two earlier years, only a slowing up, and the increase in attendance over the pre-war years is more than 100 per cent. This indicates that the demand for trained young men in the industries and the response to that demand are well sustained. In view of the present period of business depression it is remarkable that the slowing up this year is not greater.

The figures also seem to reveal an increased appreciation of the value of the best possible type of training; for while of the present recorded 9 per cent decrease for combined freshman and sophomore registration about 6 per cent is to be found in the highest grade of school and 3 per cent in the second group, nevertheless the 1920-21 peak showed an increase over the pre-war years of 85 per cent for the former and only 50 per cent for the latter.

In my opinion, therefore, in spite of the decreased entering registration this year, the figures still indicate an increase in the numbers of young men seeking education in electrical engineering and an increasing interest in its higher grades.

J. B. WHITEHEAD,
Professor of Electrical Engineering.
Johns Hopkins University, Baltimore, Md.

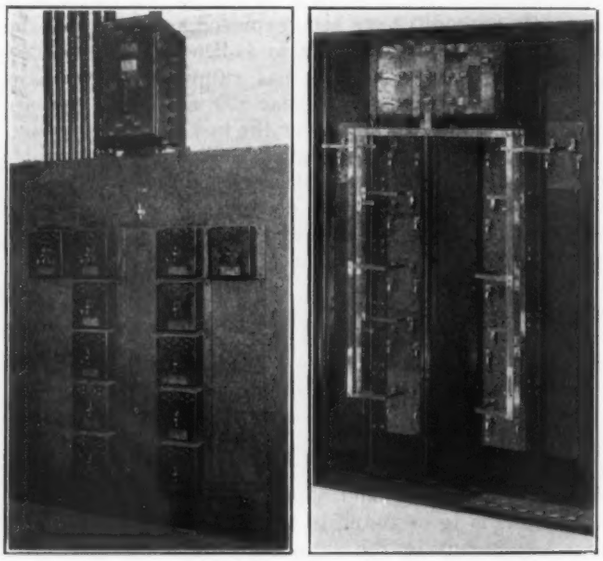
Industrial and Station Practice

Installation, Operation and Maintenance of
Generating and Distribution Equipment and Economical Utilization of Electrical Energy
in Mills and Factories, Including Testing and Repair Methods

New Circuit Breakers Replacing Fuses Reduce Maintenance

MANY of the objections to fuses, such as the necessity of replacements and the annoyance and wasted time in searching for a blown fuse, have been eliminated by the installation of the new "U-Re-Lite" circuit breakers at the Twenty-second and Racine Streets substation of the People's Gas Light & Coke Company, Chicago. A feature of these breakers is the signal window, which indicates a closed circuit when a colored disk is visible, this disk dropping out of sight when the circuit opens. These factors have reduced maintenance costs to a minimum.

The question of a proper mounting for the circuit breakers was solved when the writer designed the "dead-front" sheet-steel panelboard shown on the left in the illustration. The main consideration was to build a compact foolproof and yet accessible board. This panel is 59 in. high, 52 in. wide and 11 in. deep and has four main aisles for twenty breakers. Although at present only twelve are installed, ten 30-amp. and two 60-amp. breakers, the other compartments are fitted with covers so that if another breaker is needed this cover can be removed and then the insulated breaker base can be screwed into the same holes which held the



DEAD-FRONT PANELBOARD THAT MAKES A NEAT AND SAFE INSTALLATION, WITH BUSES READILY ACCESSIBLE

cover. The main center cover is removable, making the rear buses accessible. In order to provide for continuity of service a three-pole service switch was installed. By this means, if the motor-generator set fails, a transfer can be made directly to the central-station lines. A main 200-amp. breaker is mounted directly above this panel. The use of conduit has further simplified the appearance of the entrance cables. The easy accessibility is readily seen in the figure on the right, which shows a rear view of the panel. All circuits can be reached from the center aisle.

No actual economic data on the maintenance and operating costs of this board are available as yet, but a comparison between the costs of a regulation panel switchboard and this safety cabinet may be of interest. At the present time a single-panel switchboard consisting of twenty circuits, with 60-amp. knife switches fused on the front of the panel and terminals at the top of the panel with a main switch, would sell for $400. The safety cabinet with twenty "U-Re-Lite" circuit breakers mounted as shown would sell for $854. To offset this difference, the yearly fuse replacement costs must be considered against the first board, since maintenance costs of the second board are almost nothing.

People's Gas Light & Coke Co., JOSEPH SUERTH.
Chicago, Ill.

Synchroscope Connections Should Be Checked Before Using

WHEN a synchroscope is first put in service its connections should be checked by inserting lamps in the same phase and one other, because it will often be found that the synchroscope pointer is either 90 deg. or 180 deg. off the synchronous position when the machines are really in synchronism. Usually synchroscope brackets are equipped with receptacles for a pair of lamps in the same phase, so it is only necessary to connect the extra set of lamps in one other phase.

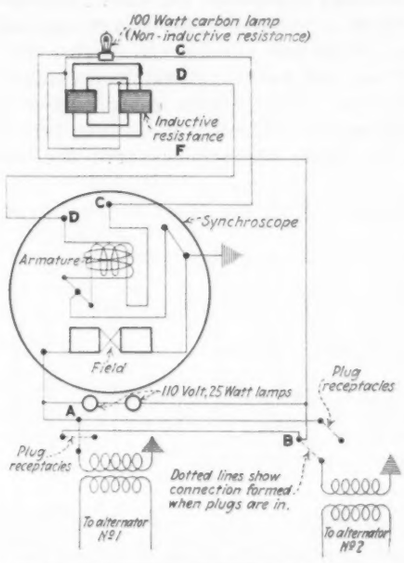
The lamps alone do not positively indicate that the machines are in phase, all that they do being to indicate zero emf., so that the lamps should become dark at the same time that the synchroscope records synchronism. If not, it is a sure indication of trouble with the synchroscope connections, machine connections or potential-transformer connections.

The type of synchroscope considered is the one found in general use and in which the armature consists of two coils at right angles connected in parallel, a non-inductive resistor in series with one and an inductive resistor in series with the other. The stationary field coil is connected to the supply bus and the armature to the incoming machine.

If both sets of lamps become light and dark simultaneously and, when they are dark, the synchroscope pointer is 90 deg. from the synchronous position marked on the dial, it will be found that the external inductive resistance and non-inductive resistance leads are reversed, that is, leads *C* and *D* should be reversed. After the connections are reversed it is well to check the synchroscope by putting voltage from the same phase of one alternator on each side of the instrument, as at *A* and *B*. The position that the pointer assumes will

be the correct position for synchronizing. This, of course, should be the position marked on the dial.

If it is found that the lamps on both phases go light and dark simultaneously, but that when the lamps are dark the synchroscope pointer shows that the machines are 180 deg. out of phase, this may mean one of two things. Either both the phases are reversed or the synchroscope pointer was reversed when it was assembled. Where potential transformers are used the trouble may also be due to reversed potential transformer leads. Great care must be used when such a condition occurs to check everything very carefully. The synchroscope should be checked by putting voltage from the same phase of one machine on each side of the instrument as previously outlined. If the pointer is found to be 180 deg. off, then it can be reversed. If it is found to be correct, then either both the phases or the potential transformer secondary or primary leads are reversed.



SYNCHROSCOPE CONNECTIONS SHOWING INTERNAL AS WELL AS EXTERNAL RELATIONS

EUSTACE C. SOARES,
Ophuls, Hill & McCreery, Inc., Electrical Engineer.
New York City.

Safety Rules for Electric Welding

RULES for the safe use of arc-welding sets which have been adopted by one Pacific Coast industrial concern have shown their usefulness through the reduction in accidents which has resulted since their enforcement.

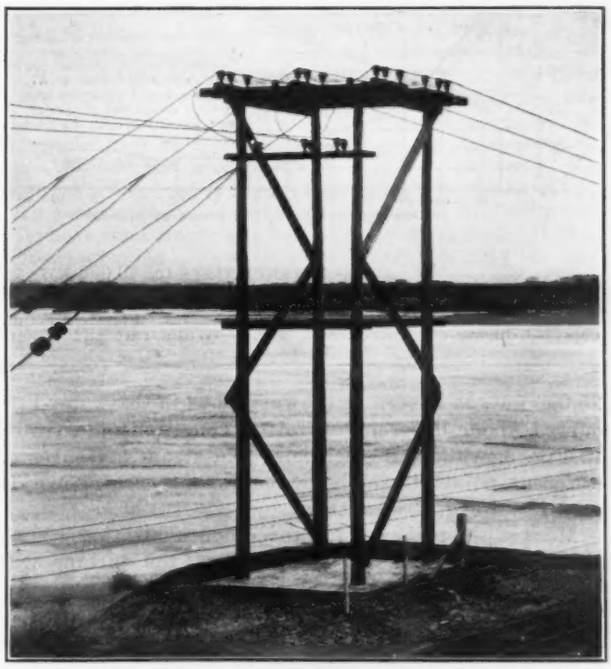
The rules given below are simple, but complete, and each welder is instructed to follow them closely:

1. *Goggles.*—When more than one person is working in a booth, each must wear amber or blue goggles to protect his eyes from accidental flashes from adjacent arcs when his hood is off.
2. *Hood.*—Always wear a hood or use a shield with amber or blue-glass window for protection of the eyes and face against harmful ultra-violet and infra-red rays from the arc.
3. *Clothing.*—For protection against burns from incandescent particles expelled from the arc, closely woven clothing, gauntlets and leather shoes having bellows tongues should be worn.
4. *Cable.*—Always have cable above the ground so that it will not be stepped on. On scaffold or platform work run the cable under the platform so that it will not be tripped over. Keep all cables as far as possible from the arc.
5. *Ground.*—Be sure the material to be welded is properly grounded before starting to weld.
6. *Scaffold Work.*—When working on a scaffold be sure that hot electrode stubs or drops of hot metal will not fall on persons below the scaffold.
7. *Footing.*—Be sure you have a substantial footing before starting the weld.
8. *Ventilation.*—There must always be sufficient ventilation in the booth to keep it clear of fumes.
9. *Welding Booths.*—Welding must be done in a booth inclosed on three sides to prevent injury to persons working in the vicinity.

San José, Cal. D. N. LOUIS.

Towers for 1,390-Ft. River Span Built from Poles

IN ORDER to avoid the cost of special steel towers on the 33,000-volt transmission line of the Central Power Company, which is needed for crossing the Platte River near Grand Island, Neb., the writer built the towers, as shown in the illustration, from four standard poles. The tower shown consists of four 45-ft. class B Western red-cedar poles, while those on the far side of the river are of the same class but 60 ft. in length. These poles are each set in a concrete cylinder 30 in. in diameter and 8 ft. deep and then tied together at the ground line with a 2-ft. concrete mat. All the "Z" bracings are built from 6-in x 8-in. fir beams, making a 7-ft. horizontal spacing between conductors. The crossing-span conductors are carried back over six pin insulators, which are slightly elevated from the outside of this tower to the center in order to distribute the thrust more evenly. Then the conductors are attached to guy rods through guys insulated with four Hewlett-type porcelain-disk insulators. Two guys were used in order to obtain a higher factor of safety on each strain string. The guy anchors are set in concrete "deadmen." The conductors consist of ⅜-in. Siemens-Martin strands



CONCRETE BASE HOLDS POLES IN POSITION ON 1,390-FT. TRANSMISSION LINE

with a clear length span of 1,390 ft. and a maximum sag computed for all conditions of loading of 21 ft. at mid-span. The maximum tension under the worst conditions of loading is under 2,750 lb. per conductor.

Middle West Utilities Company, R. J. ANDRUS.
Chicago, Ill.

Water Rate of 11 Lb. per Kilowatt-Hour Developed by 60,000-Kw. Turbine

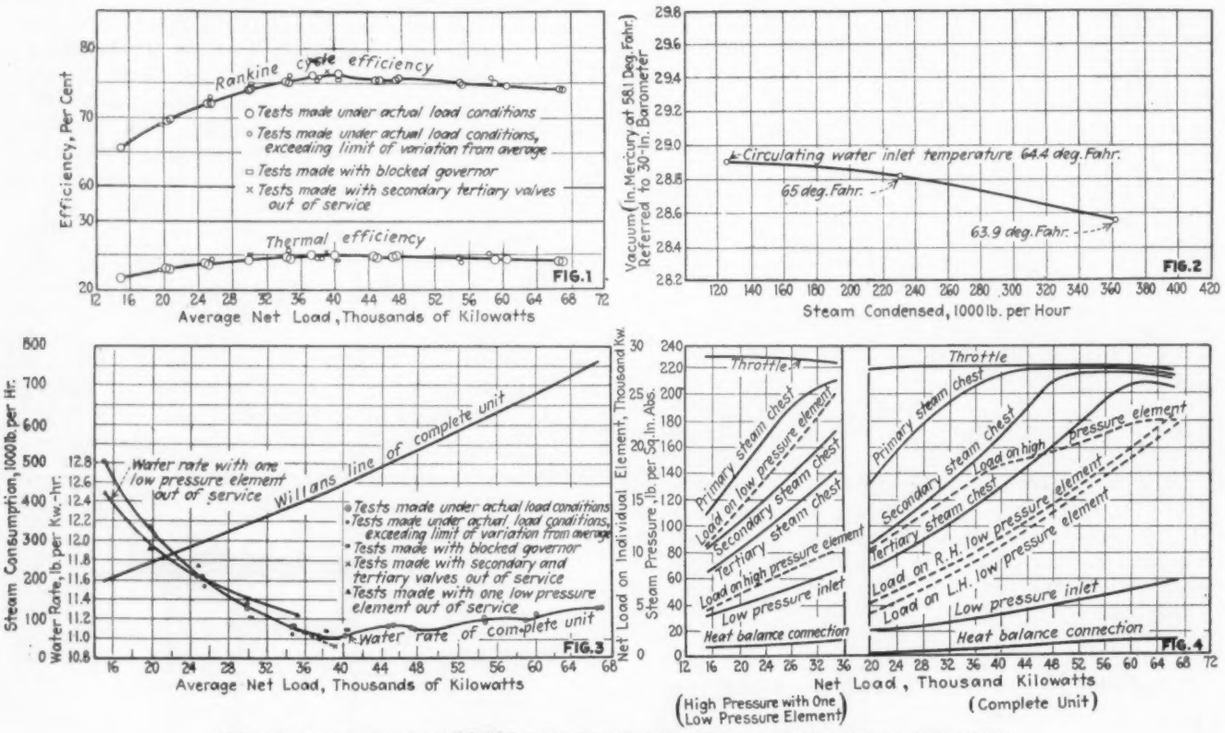
RECENT tests made on the 60,000-kw. cross-compound, triple-cylinder steam turbine installed in 1918 at the Seventy-fourth Street station of the Interborough Rapid Transit Company show that a water rate of 11 lb. per kilowatt-hour can be obtained while operating the complete unit under normal conditions. The highest Rankine and thermal efficiencies obtained were 76 per cent and 25.1 per cent respectively. With the high-pressure turbine and one low-pressure turbine in service the lowest water rate was 11.25 lb. per kilowatt-hour. When operating this way the water rate is better than that for the complete unit at loads below 25,000 kw., as is seen in the variations in the water-rate curves under different operating conditions illustrated in Fig. 3, while the efficiencies and steam pressures at different points throughout the turbine are shown in Fig. 1 and Fig. 4 respectively.

Most of the tests were of three hours duration. With the exception of a few special tests, the turbine was operated under normal conditions. The load was controlled from the switchboard through the remote governor-control system provided for that purpose. This method of controlling the load subjected the turbine to the full swings of the railroad load. Two series of tests were run, one with the completed unit in service and the other with the high-pressure turbine and one low-pressure turbine in service. A few tests with the governor blocked were made so that the unit operated under a steady load. There was no improvement in the efficiency under steady load conditions, as shown by the small squares in Fig. 1. The lowest water rate was obtained while operating with the secondary and tertiary valves out of commission and the load adjusted so that the primary valve was wide open.

The performance of the condenser—that is, the relation between the load and vacuum for the entire unit—was determined in separate tests with the results shown in Fig. 2. The condenser equipment for each low-pressure turbine consists of a two-shell, two-pass condenser, two centrifugal circulating pumps driven through reduction gears by turbines and two turbine-driven centrifugal condensate pumps. This entire equipment was supplied by the Westinghouse Electric & Manufacturing Company. Three Le Blanc air pumps serve the entire unit.

The 60,000-kw. turbine is of the Westinghouse type, consisting of one high-pressure and two low-pressure elements, each element driving a separate generator. The normal steam pressure at the throttle is 220 lb. absolute with a superheat of 150 deg. Fahr. exhausting into a vacuum of 29 in. referred to a 30-in. barometer at 58.1 deg. Fahr. The speed of all three elements is 1,500 r.p.m.

The high-pressure element is of the single-flow, straight-reaction type having a total of twenty-five stages. In addition to the primary steam inlet, which takes care of all loads up to 40,000 kw., secondary and tertiary inlet connections are provided. The secondary inlet bypasses the first six stages and is opened automatically by the governor at a load of approximately 40,000 kw. This takes care of all loads up to 50,000 kw., after which the tertiary inlet, which bypasses the first ten stages, opens and increases the capacity to 60,000 kw. The generators are able to carry a maximum load of 70,000 kw. for two hours. In order to carry this load


Efficiency, Per Cent
Rankine cycle efficiency
Tests made under actual load conditions
Tests made under actual load conditions, exceeding limit of variation from average
Tests made with blocked governor
Tests made with secondary tertiary valves out of service
Thermal efficiency
FIG. 1
Average Net Load, Thousands of Kilowatts
Vacuum (In. Mercury at 58.1 Deg. Fahr.) Referred to 30-In. Barometer
Circulating water inlet temperature 64.4 deg. Fahr.
65 deg. Fahr.
63.9 deg. Fahr.
FIG. 2
Steam Condensed, 1000 lb. per Hour
Steam Consumption, 1000 lb. per Hr.
Water Rate, lb. per Kw.-hr.
Water rate with one low pressure element out of service
Willans line of complete unit
Tests made under actual load conditions
Tests made under actual load conditions, exceeding limit of variation from average
Tests made with blocked governor
Tests made with secondary and tertiary valves out of service
Tests made with one low pressure element out of service
Water rate of complete unit
FIG. 3
Average Net Load, Thousands of Kilowatts
Net Load on Individual Element, Thousand Kw.
Steam Pressure, lb. per Sq. In. Abs.
Throttle
Primary steam chest
Load on low pressure element
Secondary steam chest
Tertiary steam chest
Load on high pressure element
Low pressure inlet
Heat balance connection
Load on high pressure element
Load on R.H. low pressure element
Load on L.H. low pressure element
FIG. 4
Net Load, Thousand Kilowatts
(High Pressure with One Low Pressure Element)
(Complete Unit)

PERFORMANCE TESTS OF 60,000-KW. TURBINE SHOW LOW WATER RATES AND HIGH RANKINE AND THERMAL EFFICIENCIES

Fig. 1—Rankine-cycle and thermal efficiencies. Fig. 2—Vacuum obtained during condenser tests. Fig. 3—Water rate and Willans line for a 60,000-kw. unit. Fig. 4—Variation of steam pressure with the load at various points throughout the turbine.

a hand-operated quaternary valve has been provided which bypasses four more stages. Since there is no relief valve on the exhaust of the high-pressure turbine it has not been possible to make full use of the automatic features.

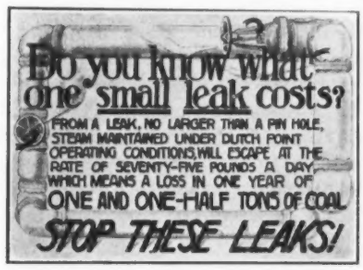
After passing through the high-pressure element the steam is exhausted through the connection on top of the casing. In the low-pressure elements the steam enters through the top of the casing and passes through a single-flow element consisting of ten stages. After passing through this intermediate section the steam divides and passes through two low-pressure sections, each containing six stages, after which it is discharged to the condenser.

FIELD EDITOR ELECTRICAL WORLD.

New York, N. Y.

Anti-Waste Posters Hit Bull's-eye at Hartford

STRENUOUS attacks on waste are being waged by the Hartford (Conn.) Electric Light Company within its operating organization, and to drive the lesson of economy home in few words and with telling illustrations a number of posters have been prepared, one of which points particularly to the evil of neglected steam leaks. The Hartford company by no means represents an inefficient organization, but even among companies noted for thrift so-called "little leaks" are at times permitted to creep into the daily work of employees. The "human interest" appeal of some of these posters and the absence of technicalities in their composition are of more than local interest.


Do you know what one small leak costs?
FROM A LEAK, NO LARGER THAN A PIN HOLE, STEAM MAINTAINED UNDER DUTCH POINT OPERATING CONDITIONS, WILL ESCAPE AT THE RATE OF SEVENTY-FIVE POUNDS A DAY, WHICH MEANS A LOSS IN ONE YEAR OF ONE AND ONE-HALF TONS OF COAL
STOP THESE LEAKS!

Boston, Mass. FIELD EDITOR ELECTRICAL WORLD.

Electric Range Service Cost Reduced by Auto-Transformers

THE use of auto-transformers for supplying service to electric range loads from existing lighting secondaries has been found by the Portland (Ore.) Railway, Light & Power Company to be very economical for this class of business. This differs from the usual practice of installing an individual transformer for each range in order to avoid unbalancing the load. The auto-transformers eliminate the expense of extending the primaries and hanging an extra transformer. These auto-transformers are merely balance coils the outside leads of which are connected to the 220-volt secondaries. The 110-volt tap serves as the neutral line feeding the load. This reduces the voltage drop by placing the entire load on the 220-volt secondaries. The auto-transformers are rated at 3 kva. and will correct a 3-kva. unbalance in load on the range. They are provided with two 5 per cent voltage taps which may be used for compensating for voltage drop.

By the use of these auto-transformers the cost of an average range service has been reduced to $40 from the former cost of $85. These figures do not include the cost of transformers but do embrace the handling and mounting of the transformer and the expenses of running service wires, etc.

W. C. HESTON,
Industrial Power Engineer.

Portland Railway, Light & Power Company,
Portland, Ore.

Operating Instruction for Handling Excitation Troubles

A GOOD operator must know among other things the proper course to follow when there is trouble on the exciting circuits or apparatus of generators. Some good information regarding such trouble has been compiled by the Pennsylvania Water & Power Company, a part of which is given in the paragraphs following. The instructions quoted refer particularly to the operation of water-power generators at the Holtwood station of this company. Some of the instructions which have been issued are:

Opening of Field Breaker.—Should a generator field breaker accidentally open while the unit is on the bus, and the unit has not fallen out of synchronism, close the breaker immediately. If the unit has fallen out of synchronism, reduce the gate opening until it falls in step and then close breaker. In case a generator is accidentally or otherwise cut off the bus or is needed quickly and is still running at approximately normal speed with an open field, connect the generator directly with the bus without synchronizing and a few seconds later close the field breaker. This is permissible only after a serious disturbance to service or large loss of load or at a time when the system is suddenly overloaded, due perhaps to trouble developing in parallel steam plants. This operation will cause a 5 to 8 per cent disturbance in voltage.*

Use of Master Field Switch.—In stations that have this type of switch, in case of a complete shutdown or at other times when the generators for one reason or another have fallen out of synchronism and are cut loose from the bus and a large generating capacity is quickly needed, all the generators may be paralleled simultaneously by connecting them with the bus, without fields, and then closing all the fields simultaneously by means of the master field switch. Such generators as may not be concerned in this operation must have their single-pole field-relay switches in the "hand-control" position. Two or more generators may at any time, whether during an emergency or not, be paralleled by this method of tying them together and closing their fields simultaneously.

Field Rheostat Trouble.—If an open circuit occurs in a field rheostat while in service, open the field breaker and take the machine out of service. When its generating capacity is badly needed leave it in service without field, but generating as much as possible, until steam capacity or another generator can be paralleled. It may be possible to restore the full capacity of the generator, when necessary, if the break in the field rheostat is at a point which can be cut out by running the field rheostat contact arm farther toward the out position. In case this cannot be done, repairs must be made at once by short-circuiting the open-circuited section of the rheostat with a jumper of sufficient carrying capacity.

If the field discharge switch fails to open when a breaker is closed, open and close the breaker again, repeating once or twice as required. In case the discharge switch fails to open in this manner, leave the breaker open and open the discharge switch by hand. The field discharge resistance will burn out if the breaker is allowed to remain closed while the field discharge switch is closed.

FIELD EDITOR ELECTRICAL WORLD.

New York, N. Y.

*Applies only in this case.

Management and Policy

Embracing Central Station Commercial Organization and Management, Customer and Trade Relationships, Public and Financial Policies, Advertising, Selling and Service Methods

Wage Problems of the Central Station

A Graphic Analysis of the Real Value of Compensation Paid to Different Classes of Employees

AN INTERESTING method of studying central-station wages from the angle of their actual purchasing power used by the Hartford (Conn.) Electric Light Company is shown in the charts on this and the following page. The underlying principles of this method were described by Samuel Ferguson, vice-president of the company, on page 26 of the Jan. 7 issue of the ELECTRICAL WORLD. In brief, the procedure is to plot percentage changes in wages and cost of living against time, the ratio between the money wage and the cost of living curves giving points on a third curve designated as "real" earnings and so indicating the true or actual purchasing power of the employee's compensation.

Typical employees' wages at Hartford have been studied from this angle, and in general 1914 standards of living were taken as the base. Where a long period of disproportionately higher purchasing power has been shown, the wages have in some cases been readjusted downward, as on Chart No. 2 for ashmen. Where the purchasing power has run below normal for a considerable period or has not exceeded normal for an undue time, the presumption favors the retention of the present wage. The method is naturally applied with a knowledge of local conditions and personnel not reducible to computation, but it does offer a "yardstick" of compensation which has quantitative merit.

Not the least interesting of these charts is No. 3, which shows that the wages on capital—that is, dividends on company stock—dropped from the "real" earnings standpoint to about 50 per cent of normal in 1918, and up to the end of 1921 had barely attained 60 per cent of their pre-war purchasing power. No better evidence than this could be shown as to the effect of war costs on the investor, who has received far below his fair reward in buying-power for the capital invested.

Effective Office Arrangement Viewed as a Good-Will Asset

THIS picture, showing the attractive and convenient arrangement of the office of the East St. Louis Light & Power Company, drives home the thought that the use of space for central-station offices and display rooms is not a matter for offhand settlement. The picture was taken from in front of the cashier's window and shows the complaint department located adjacent to the consumers' ledger department to facilitate reference to original records. On the left are the appliance and lamp renewal counter, the general office of the contract department and the new-business manager's office. The repair department for servicing appliances is in the basement and can be reached by using the elevator on the right-hand side or the stairway just beyond.

Too much thought cannot be given to laying out the

Relation of Money Wages, Cost of Living and "Real" Earnings for Linemen, Unskilled Labor and Capital

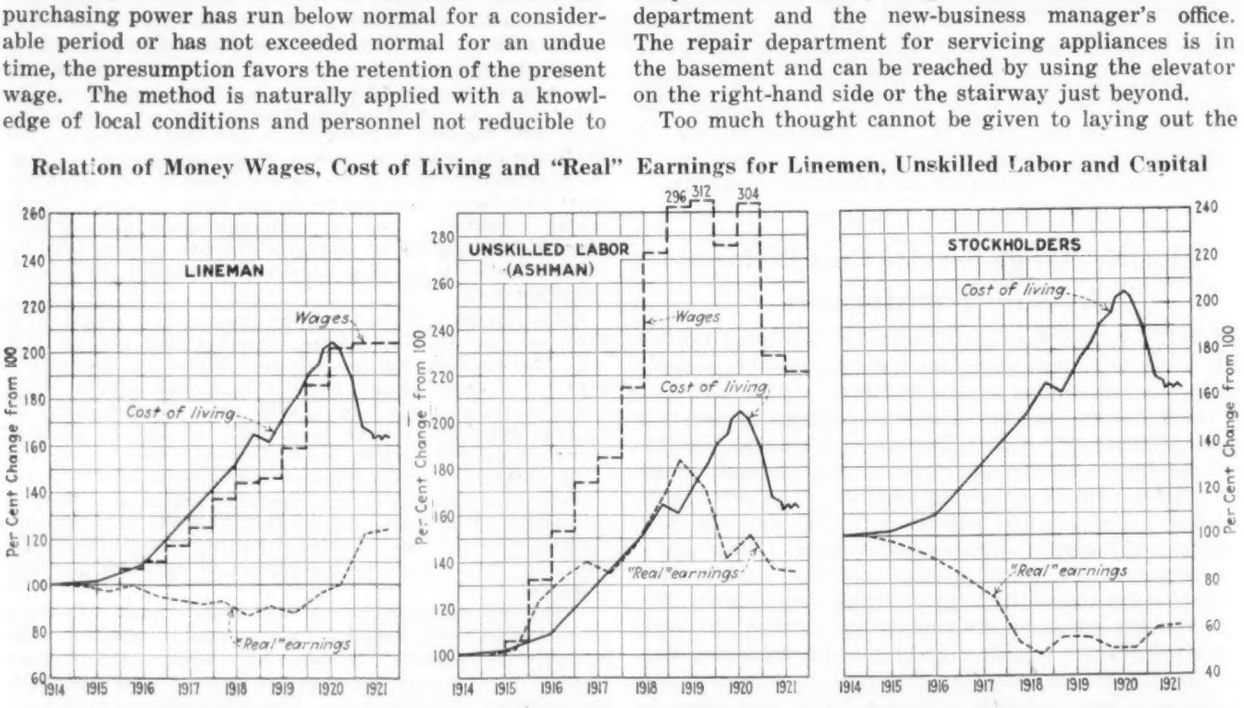


Chart 1.—In this case a lineman's "real" wages did not catch up with the cost of living until more than a year after the war ended. The accumulated deficit in purchasing power in this case warranted a continuation of the maximum wage shown to the end of the chart period.

Chart 2.—A wage reduction here was clearly shown to be fair when the purchasing power of the wages from 1914 on was plotted. War-time expansion of pay brought rapid and continuous prosperity to the grade of unskilled labor included until about a half year after the armistice. Not until the end of 1920 did a permanent wage reduction take place, and the accumulated surplus buying power as compared with 1914 amply justified it.

Chart 3.—The wages of capital expressed in real earnings of dividend money slumped so far during the war that the stockholder was grossly underpaid in comparison with many classes of employees. This chart expresses what happened to people with fairly fixed incomes during the war and shows that only within the past year or two has a change for the better begun to appear.

office and display room of the public utility, for it is here that most people form their impressions of the company. The severe formality of banking-house furnishings is forbidding to the average customer, and a slipshod, just-sufficient-to-answer-the-purpose office reflects on the company in the minds of the public. But

VIEW OF EAST ST. LOUIS COMPANY'S SALESROOM AND OFFICES

a pleasant, comfortable-appearing office, like that of the East St. Louis company, encourages appliance sales, facilitates the routine work of handling customers who come in to pay bills or to make inquiries about their accounts, creates a favorable first impression on new customers and adds to the prestige of the company.

A Real Testimonial to Utility Service

THE Cumberland Valley Light & Power Company of Harrisburg, Pa., recently extended its service to several towns adjacent to its lines in Adams County. Upon completion of the work this letter was received from the county commissioners:

To the Cumberland Valley Light & Power Company:
Harrisburg, Pa.

GENTLEMEN: At a meeting of the electric light committee representing East Berlin and Abbottstown, held on Feb. 3 in the office of P. C. Smith in East Berlin, I was instructed to extend to your company sentiments of appreciation of the pleasant business relations our committee experienced with your people in all of our transactions. Our committee appreciates the expedition with which the work progressed and the comparatively short time in which our dreams came true.

The service reflected in the homes and on the streets of our communities is so good that it must be gratifying to you to know that we think you did a good job. The patience, tact and candor of your Mr. L. Weiss in the solution of our problems indeed contributed very much to the success of our project.

Wishing you a prosperous business, and pledging you our moral support in this enterprise in our communities, we are yours truly,

GEORGE W. BAKER,
For the Committee.

More depends on what the neighbors say than on the protestation of the utility only, and no form of evidence of character has been devised that carries more persuasion and conviction than a testimonial. Letters like this should be secured wherever possible and treasured not in a corner but in the light of day where men may read and understand.

What Other Companies Are Doing

Oklahoma.—Two towns, Geary and Watonga, will discard municipal plants soon, having voted bond issues to build transmission lines to connect with the transmission lines of the Enid division of the Oklahoma Gas & Electric Company. Completion of these lines will make a total of 43 miles of transmission line operating from the Enid plant.

Miami Beach, Fla.—The Miami Beach Electric Company reports a very satisfactory increase in the use of electric ranges by its customers. More than 300 electric ranges are now in use on the company's lines, and one or more additional ranges are added each week. R. L. Ellis is general manager of the company.

Chicago.—Electric energy output at the subsidiary properties of the Standard Gas & Electric Company for January, 1922, was 9.2 per cent greater than for the same month of 1921. The output for the year 1921 was 5.7 per cent in excess of that for 1920.

Cambridge, Mass.—The Cambridge Electric Light Company plans to conduct an active campaign for the sale of electrical merchandise during 1922. In the power field an engineer has been added to the staff to specialize on isolated-plant users and the year will see vigorous efforts to introduce the company's service where it will save operating costs or improve the quality of the product manufactured.

Relation of Money Wages, Cost of Living and "Real" Eearnings for Metermen, Executives and Clerks

Chart 4.—At first the buying power of a meterman's wage increased faster than the cost of living, but later, notwithstanding continued increases in the wage, the rise in living cost overtook and passed the "real" wage, so that up to the end of 1920 the meterman was little if any better off than in 1914, taking the period as a whole. Some increase in the standard of living usually accompanies higher wages, and this has to be taken into account in studying wage trends.

Chart 5.—This executive appears to be little if any better off than in the pre-war period, and the chart presents no evidence of undue compensation. The popular idea sometimes set forth that public utility executives share, ex officio, huge profits through increases in their salaries has no foundation here.

Chart 6.—The clerk whose wage trend is shown here was in much the same case as the lineman of Chart 1, and similar comment applies.

Manufacturing and Distributing

Devoted to the Discussion of Production, Distribution and Market Development, the Business and Economic Problems of the Manufacturer, Jobber, Agent, Contractor and Dealer

What Will Happen When the Nickel-Chromium Patents Expire?

By M. C. Turpin

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

THERE has been considerable speculation of late among the manufacturers of electric heating devices as to what may be expected when the nickel-chromium wire patents expire in 1923. Similar conditions have arisen in the electrical industry before, but when the blow fell it was generally found to be a blessing in disguise. One example was the case of the induction-motor patents.

M. C. TURPIN

Prior to their expiration, when induction motors were made only by the holders of the patents and their licensees, it was feared that when the bars were let down the market would be flooded by a host of poorly designed, inefficient, and crudely constructed motors that would give a bad name to the whole electric motor industry. What really did happen? A lot of firms did enter the field and began the manufacture of electric motors, and, as always happens, the weaker ones fell by the wayside and helped to fill the graveyard of disappointed hopes. Those who built a good motor and marketed it along sound merchandising lines are enjoying a well-deserved success today. The original motor-manufacturing companies redoubled their efforts, improved their products, began to search for new fields of motor application, and as a result where one horsepower of motor capacity was used before hundreds of horsepower are in use today.

A somewhat analogous case, though not involving the patent situation, was presented with the advent of the tungsten and gas-filled lamps. When this improvement was first introduced calamity howlers raised their voices to the heavens and predicted an early receivership for the central-station industry because of the reduction of revenue that would ensue. Have any central-station companies gone into bankruptcy because of the substitution of the highly efficient "Mazda" lamp for the old-style carbon-filament lamp? The same thing was true of the gas companies on the introduction of the Welsbach mantle for gas burners.

In much the same manner, it seems to me, we may expect the expiration of the nickel-chromium wire patents to affect the industry. There possibly will be some additional entries into the field of electrical appliance manufacture by firms or individuals of varying degrees of financial and merchandising ability. However, the restrictions under which the appliances have been manufactured have established their high quality in the minds of the public, which will continue to demand the same standards of performance, finish, beauty of design and service. There have been and are many cheaper appliances on the market, but we believe that the quality of product made under the Marsh patent license is what the public wants. If this is the case, any reductions in prices will be dependent on further reductions in materials and wages.

Public Will Demand Quality and Service

The quality prop may be withdrawn, but the manufacturers, if they hold up quality and margins of distribution, will still have to maintain present prices on the majority of appliances in order to stay in business. Cheaply constructed appliances may be sold, but they won't stay sold. The public has been educated to expect service from electrical devices. People have been taught to expect repairs to be made free of charge when caused by defective design or workmanship, and it can hardly be supposed that they will put up with anything less.

I do not want to convey the impression that there is not much work, and hard work, ahead of the present manufacturers, for there is. But they have the advantage of the prestige they have created for their product in the minds of the public by consistent advertising, quality product, and other essentials of good merchandising practice. These activities must be redoubled and every effort made to capitalize on the reputation already gained.

The remarkable increase in the use of electric appliances during the last few years has been accentuated to a large degree by the shortage of domestic labor and the rapid extension of high-tension lines by the power companies. This means a much wider market for appliances, which will continue to grow with the added impetus of such developments as electrically wired furniture, the establishment of "electrical homes," the installation of convenience outlets, and other movements under way in the industry.

Summing up the situation, it appears that after the expiration of the patents we may expect some new arrivals in the field, but the only survivors will be those who supply a quality product, marketed along the lines of modern business principles. The public has been educated to expect quality and service and will continue to demand it. Increased demand for electrical appliances will continue and invite competition, which, if fair, will not be feared by existing manufacturers. Those manufacturers who have built up a name for themselves and their product will, if they increase their activities along proper advertising and merchandising lines, be able to maintain their prestige.

Manufacturers Should Limit the Number of Representatives in Territories

BY WILLARD W. LOW
President Electric Appliance Company, Chicago

MANUFACTURERS of electrical supplies who have had any large experience in the sale as well as the manufacture of their products are usually eager to secure the co-operation of the electrical jobbers in marketing these supplies. Manufacturers as a whole concede that the electrical supply jobber is an economic factor in the distribution of electrical supplies by the very fact that they are making use of their facilities. But the jobbers at the present time are not prospering.

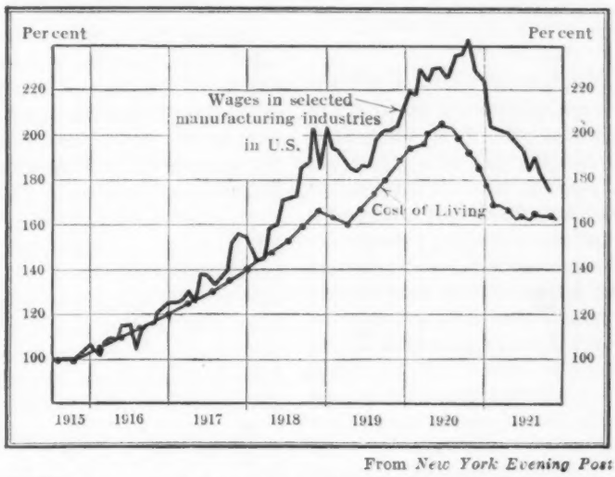
The trouble appears to be that too many manufacturers feel in some way or other that the economics should all be on one side. They are eager to utilize the service of the electrical supply jobber because an equivalent service inevitably costs the manufacturer more when undertaken by himself than it does when the electrical supply jobber performs that function for him. But the same manufacturer will seek to make the compensation to the electrical supply jobber for this service a good deal less than the experience of the electrical supply jobber indicates to be necessary and desirable.

The manufacturer probably also has in the same city a number of representatives or agencies, in addition to the jobber, that regularly carry the manufacturer's products. Obviously this practice creates a duplication of sales effort and stock investment—that is, of the very facilities that the electrical supply jobber is already maintaining in that territory for the manufacturer. The question is, therefore, Should the manufacturer thus utilize the jobber's service and then turn so many dealers into jobbers, duplicating that service so far as sales expense is concerned, and duplicating the warehousing requirements of the jobber?

To come right down to specific opinion, I believe that manufacturers of stable electrical products should confine themselves to factory stocks. The obvious situation that would come out of this is that the electrical supply jobber who is doing a real job in warehousing stocks would not be at the mercy of the manufacturers who carry stocks in many places and supply so-called jobbers who are in fact only retailers. The difficulty in this whole situation is not so much in any misunderstanding that exists either on the part of the manufacturer or the buyer as to the function of the electrical supply jobber. The trouble lies largely in the misinterpretation of the jobber's function upon the part of the manufacturer, by the partial use he makes of the jobber's warehouse or the competition which he himself sets up.

To sum up the whole thing in a few words, the distribution of electrical supplies through electrical supply jobbers is acknowledged to be economical by the very fact that the manufacturers utilize this service to their advantage and therefore desire it. What is needed most in the situation is to turn the minds of both the manufacturer and the user to a proper appreciation of the service of the jobber. They must realize that they cannot get the most out of the jobber when they themselves set up a sales resistance against him and weaken his ability to serve.

Living Costs Decline More than Wages



From *New York Evening Post*

THIS chart should have more than passing interest for the manufacturer and distributer of electrical appliances. It shows that wages in selected manufacturing industries continue relatively higher than the cost of living. This margin of wages over living costs, if properly developed, offers a strong potential market for the sale of electrical devices to the home.

A Warning to Exporters

BY JULIUS KLEIN
Director Bureau of Foreign and Domestic Commerce, Washington, D. C.

WELL-AUTHENTICATED confidential advices received by the Department of Commerce from various sources indicate the recurrence in a virulent form of an old evil which has from time to time imperiled individual interests in the export trade, but now seems to be directed against certain exporting industries as a whole. The means employed are to tie up the American exporter in an agency agreement and to push competing goods of foreign make under the protection of the existing agency agreement.

It is absolutely essential for the present prosperity and the future welfare of the American export trade to exercise the most rigid scrutiny over the details of agency agreements which tie up the exporter in a certain territory. Is your agent bound by open or secret affiliations to interests other than American? Does the agency agreement permit him to paralyze the active promotion of your interests and to devote himself actively to the sale of competing goods? The danger outlined is not a mere bugaboo but actually exists and flagrant cases have been submitted as evidence.

The problem which the situation presents is exceedingly delicate and difficult. The solution—to intrust the agency of an American firm to a strictly American agency organization—is simple enough, but cannot be everywhere applied in practice because such organizations are comparatively few. It has been suggested that where an American firm cannot be found a native firm, free from any suspicion of foreign affiliations, should be intrusted with the agency, but even this expedient may not always answer. In many markets the distribution of goods has never been in native hands.

It is the obvious and immediate task of American business to create throughout the world a network of American agencies, or at least agencies whose loyalty is not pre-empted by racial or commercial ties antagonistic to American interests. The thing to be done at once is to examine the basis of all agreements with foreign agents and analyze their affiliations carefully.

Digest of Electrical Literature

Including Brief Abstracts of and References to Important Articles Appearing in the Scientific and Engineering Press of the World

Generators, Motors and Transformers

The Petersen Earth Coil.—R. N. CONWELL and R. D. EVANS.—The essential part of this apparatus is a suitable reactor connected between the neutral of a circuit and ground. This reactance is chosen at such a value as to neutralize the capacitance of the circuit when an accidental ground of one phase takes place. Under this condition the reactor is electrically in parallel with the active capacitance, and by the well-known fundamental law the only current that flows to the combination of the inductance and capacitance in parallel is the current necessary to supply the energy lost in the combination. The advantages and disadvantages of the Petersen earth coil are enumerated.—*Journal of the A. I. E. E.*, February, 1922.

New Viewpoints in the Criticism of Chain-Type Insulators.—W. WEIKER.—A close scrutiny of the relative advantages and disadvantages of the two most-used types of chain-type insulators—viz., the link type and the cap-and-pin type. The author investigates outer form, disk diameter, assembled length, arcing and puncture values, capacity, distribution of voltage, mechanical strength, economy and installation. The study shows in almost all instances a theoretical superiority of the cap-and-pin type, although practical experience extending over a period of several years proves that the link-type insulator shows good performance in practical service. A few of its inherent shortcomings compared with the cap type can be easily overcome by enlarging its disk diameter, crossing of the cable loop between adjacent disks, arcing horns, etc. However, all this has been based so far on voltages of not more than 110 kv. In general it may be safely assumed that the two types are about equal in their performance, and only future experiences with a higher voltage may lead to a definite decision in favor of the one or the other. The article contains a great many characteristic curves and photos of arc-overs under various conditions.—*Elektrotechnische Zeitschrift*, Dec. 22 and 29, 1921.

Lamps and Lighting

Recent Departure from Usual Lighting Practice in Public Spaces and Offices.—A. D. CURTIS and J. L. STAIR.—This article deals with some special requirements that had to be met in buildings of unusual size or construction. Some of the examples are the Dixie Terminal in Cincinnati, the "great hall" of the Cunard Building in New York City, the Field Museum of Natural History and the Cosmopolitan State Bank of Chicago.—*Transactions of the I. E. S.*, Dec. 30, 1921.

The Lighting of Signs and Billboards.—J. M. SHUTE.—A study of the problem of constructing electric signs and billboards to obtain maximum effectiveness. The author discusses the design of letters as to spacing, size and type in signs with visible lamps and the selection of lamps as to size and type for large metropolitan roof signs, small and low-hung signs and talking signs. Results of a study of signs with concealed lights and of painted signs and billboards illuminated by reflected light are also given.—*Bulletin L.D. 131 of the Edison Lamp Works.*

The Use of "Alignment Charts" for Illumination Calculations.—L. BLOCH.—In all branches of electrical measurements and calculations the use of the so-called "alignment charts" becomes daily more popular. The author describes in a general way the principle of these charts and opens up a new application of them to different calculations in the illuminating field.—*Elektrotechnische Zeitschrift*, Jan. 19, 1922.

Generation, Transmission and Distribution

Oil for Power Production.—J. H. DOBSON.—An investigation carried on in behalf of the South African Institution of Engineers into the use and production of fuel oil in South Africa. The article also contains a description of the use of oil in boilers and in Diesel and semi-Diesel engines.—*Journal of South African Institution of Engineers*, December, 1921.

Power Transmission in Industrial Plants.—KENNETH M. RAYNOR.—A description of the power-transmission installation at the Bethlehem Steel Company worked out by the electrical department of this company to insure reliability and continuity of service. The system installed in this plant consists of a 6,600-volt, 25-cycle, three-phase balanced-current overhead loop.—*Journal of A. I. and S. E. E.*, January, 1922.

Heating the Domestic Water Supply Electrically.—J. A. MACDONALD.—A cost comparison between heating water for home use by coal and heating it by electricity. With coal at $15 per ton, electricity at a flat rate of $3 per kilowatt per 720-hour month is shown to be cheaper.—*Electrical News*, Jan. 15, 1922.

Recent Development in the Electrical Industry of England.—T. P. WILMSHURST.—A review of the developments in the electrical industry tending to cheapen the supply and to render service more reliable. A general discussion is given on power plants using both coal and oil fuel, with examples of standard practice. Remarkable advancement is shown in the use of transmission cables.—*Journal of Institution (British) Electrical Engineers*, December, 1921.

Traction

Electrification of the St. Gotthard Railway.—The actual equipment of the railway that runs from Lucerne to Chiasso on the Swiss-Italian frontier is described. Two hydro-electric generating stations, one at Amsteg and the other at Riton, supply energy at 60,000 volts for transmission. This is reduced to 15,000 for trolley use. The locomotives are manufactured by the Oerlikon company.—*Engineer (London)*, Jan. 20, 1922.

Hydraulic Transmission for Electric Locomotives.—WITTFELD.—The use of a hydraulic transmission between the motor and the drivers of an electric locomotive for single-phase alternating current brings with it a

number of advantages and improvements. Such transmissions have been developed by Lentz and have shown an efficiency as high as 90 per cent. Synchronous 50-cycle motors could then be used and would afford great advantage over the present 16⅔-cycle systems, which require special power houses or inefficient frequency-changer sets.—*Elektrische Kraftbetriebe und Bahnen*, Jan. 10, 1922.

Installations, Systems and Appliances

The Electric Furnace.—H. M. ST. JOHN.—An account of the mechanical and semi-automatic features of the electric furnace whereby an operator who follows instructions can produce a uniformly high quality of product with less labor and less metal wastage than was previously possible. With the fuel-fired furnaces a cause of much loss of material is that there is either too much oxygen and the charge is oxidized or there is too little and the fuel is partly unconsumed, causing a loss in metal as the unconsumed products of combustion attack the molten matter. This difficulty is overcome in the electric furnace. In conclusion this article describes what the electric furnace has accomplished in melting brass.—*Electrical Review and Industrial Engineer*, January, 1922.

Direct Current or Alternating Current for Magnetic Chucks.—B. WITTKUHNS.—The author made some tests on a magnetic chuck for alternating current to determine its properties when compared with direct-current chucks. A three-phase model was tested, the energy consumption of which was 120 watts in Y connection and 450 watts in delta connection on 220 volts. A similar chuck for direct current requires only 60 watts. The heating of the alternating-current chuck was 90 deg. after three-quarters of an hour and 160 deg. after two hours, which is very much higher than for a direct-current model. The power factor of the alternating-current chuck was about 0.3, which would be very undesirable for a shop using any appreciable number of these chucks. The attractive power was only about one-third to one-half that of a direct-current chuck of same size. The only advantage of the alternating-current chuck is the instant demagnetization attained with its use, but there are a great many insurmountable disadvantages.—*Elektrotechnik und Maschinenbau*, Jan. 29, 1922.

Calculation of Anode-Furnace Charges in a Copper Refinery.—C. M. BRISTER, JR.—The method of making up charges for an anode furnace in a modern electrolytic copper refinery is described. Analyses of various brands of blister copper are given, and the calculations are performed in detail to show the various factors.—*Engineering and Mining Journal*, Jan. 28, 1922.

Electrochemistry and Batteries

Small Silver-Reclaiming Plants.—G. EGER.—At the present European prices of chemicals in general and acids in particular it has been found cheaper to reclaim silver out of the dust of mints, jewelers' refuse, etc., by the electrolytic process rather than by purely chemical methods. Using nitrate of silver as an electrolyte, a potential of 1 volt per cell and a current density of 250 amp. per square meter will give best results. Four cells are used in series, each containing six cathodes and fifteen anodes. To prevent the growth of silver deposit from the negative plates on the anodes, which would short-circuit the cell, the cathodes are inclosed in muslin bags and are, in addition, moved slowly backward and forward during the process. A standard set of four cells is described, which gives 35 kg. of refined silver in eight hours, consuming 280 amp. at an efficiency of 96 per cent.—*Siemens Zeitschrift*, January, 1922.

Electrolytic Production of Metallic Magnesium.—S. T. ALLEN.—The new electrolytic process of obtaining metallic magnesium developed by the Magnesium Company, England, is described. In this process magnesium chloride is reduced by metallic sodium. To obtain satisfactory yields the magnesium chloride must be anhydrous, in which form it can be electrolyzed for the direct production of magnesium.—*Electrician (London)*, Jan. 27, 1922.

Telegraphy, Telephony and Signals

Radio Service on the French Fishing Fleet.—Radio apparatus ranging from 250 watts to 1,000 watts capacity are installed on more than 200 French fishing schooners where in 1915 there were only thirty thus equipped.—*Radioelectricité*, January, 1922.

High-Speed Wireless Telegraphy.—A. C. T. CUSINS.—The author describes apparatus which has been designed and experimented with between London and Cologne. The aim of the equipment is to provide apparatus which shall enable wireless communication to be carried on mechanically, both in transmission and in reception, at speeds up to the maximum of Wheatstone apparatus.—*Electrician (London)*, Jan. 20, 1922.

Mechanical Action of Sound Produced by a Telephone Receiver.—K. KUROKAWA.—The article describes, with photographic illustrations, some remarkable mechanical actions of sound produced by a telephone receiver traversed by an alternating current of telephonic frequency. These actions are: (a) Attraction or repulsion between a suspended disk and a sounding receiver; (b) pumping action of sound or a receiver; (c) driving of a small wheel by air currents induced by sound; (d) dancing of grains of powder between the cap of a sounding receiver and a horizontal plate. The author gives explanations and qualitative results of these mechanical actions.—*Journal of Institute of Electrical Engineers of Japan*, January, 1922.

Miscellaneous

New English Electrical Instruments and Relays.—All recent developments of electrical instruments in England shown at the annual exhibition of the Physical Society and the Optical Society of London are described in this continued article.—*Electrician (London)*, Jan. 13, 20 and 27, 1922.

Some Developments in the Electrical Industry During 1921.—JOHN LISTON.—Review of the progress that was made in the manufacturing branch of the electrical industry last year. One important development of the twelve months was the successful generation, insulation and measurement of current at commercial frequencies with potentials exceeding a million volts. The practical results from this are problematical, but the data obtained make it possible to calculate transmission lines utilizing potentials greatly in excess of those used at present. Another very important feature of the year was the great increase in the use of automatic generating stations and substations. The first Diesel-engine electrically propelled merchant ship in the United States was completed. Marked progress was made in steam-road electrification, arc and induction furnaces, electric welding, high-voltage and capacity transformers, and in the radio field.—*General Electric Review*, January, 1922.

New Books

Reviews of the latest contributions to technical, industrial and commercial literature of particular interest to members of the electrical industry.

GRIMSEHL'S TEXTBOOK ON PHYSICS. Edited by Dr. Hillers and Dr. Starke. Vol. I—Mechanics, Acoustics, Thermics, Optics. 1,030 pages, 1,049 illustrations, 10 colored tables. Fifth edition. Vol. II—Magnetism, Electricity. 635 pages, 548 illustrations. Fourth edition. Leipzig and Berlin: B. G. Teubner.

These volumes are among the best and most widely used textbooks on physics in Germany and other German-speaking countries. Grimsehl himself succumbed in the war, but his lifework has been carried on admirably by Hillers and Starke, who have edited both the latest editions. The high pedagogical value of these volumes lies in the use of a host of specially devised experimental apparatus built in such a manner as to demonstrate to the student the many physical phenomena in the most plausible way; but at the same time drawings and photographs of the practical and actual use of the described apparatus are given in each case. The volumes are fully up to the minute, including, for example, the latest theories of Millikan on the electron theory and Einstein's theory of relativity.

SILVANUS PHILLIPS THOMPSON, D.S.C., LL.D., F.R.S.: His Life and Letters. By J. S. Thompson and H. G. Thompson. New York: E. P. Dutton & Company. 372 pages, illustrated.

As one reads this altogether charming and admirable biography the regret grows that he who wrote such excellent lives of Faraday and Kelvin could not have found time to add one on that great forerunner, Benjamin Franklin, with whom he had so much in common in mental alertness, literary ability, political opinions, insatiable thirst for knowledge and swift insight into new physical conceptions. It has sometimes been a wonder why Dr. Thompson did not line up with Dr. Franklin in the making of really prime additions to electrical principles. He was always probing the unknown, ever on the verge of important discovery with others, and had a marvelous intuition backed by extraordinary gifts of exposition, as his useful books and splended educational work testify.

The reason is here disclosed. He was too much the Admirable Crichton of his times. The revelation presented of delightful hobbies and irrepressible enthusiasms reminds one of a story—not told in these vivid pages—of the visit paid to Morland by a famous American electrical inventor, to whom the buoyant, brilliant Thompson, in quick succession, showed his valuable library of early physical literature, his electrical experiments, his clever water colors, his floral hybrids, his caricatures, his instruments, his researches in sound and music, and other cherished possessions not a few. As the American left the home of the translator of Gilbert he turned to his entertainer, expressed keen pleasure over a delightful evening, and then, feeling keenly his own narrowness of interests, and putting a hand gently and regretfully on the shoulder of his host, said: "And now I know, Thompson, why you are not the great electrician you ought to be!"

The American references in these fascinating chapters might well be more numerous than they are, but we are glad to see so many, especially those to Elihu Thomson, Elisha Gray, Kennelly, Edison, Tesla and "Mr. Graham Bell," with whom the protagonist of Philipp Reis seems to have had a chummy good time after all. Nor may it be amiss to note mention of two former editors of the ELECTRICAL WORLD with whom Dr. Thompson had correspondence from time to time and with whom he was long on terms of personal intimacy.

This book is indeed welcome as one of the foremost biographies of the year, and the reviewer closes its perusal with the desire that it may be as widely read in America as in Europe. To which should be added hearty congratulations to the wife and daughter who, with such felicitous sense of proportion and unusual fitness of expression, have delineated this ideal but not idealized portrait of the noble "Brother Magnetizer," influential shaper to a notable degree of the modern electrical arts and sciences, so well described as historian by himself.

TESTING OF ELECTRICAL MACHINERY. By J. H. Morecroft and F. W. Hehre. New York: D. Van Nostrand Company. 220 pages, illustrated.

This book is being used by the authors at Columbia University for non-electrical students whose work along electrical lines has materially increased since the third edition was brought out. For this reason the present edition, the fourth, contains in addition certain experiments on batteries, illumination, measurement of electrical energy, etc., on which subjects a non-electrical engineer frequently has to pass judgment.

THE ELECTRIC FURNACE. By J. N. Pring. New York: Longmans, Green & Company. 483 pages, 426 illustrations.

In none of the fields of application of electricity, probably, has there been more development during the last few years than in the use of electric heat for electrochemical and metallurgical processes and for heat-treating. It is therefore with considerable satisfaction that we observe the publication of a résumé of this development. Although we should like to see a book by an American engineer on economic aspects of electric furnace operation in the United States, this contribution by an English engineer has its advantages because he is able to view at close range some of the European installations of note and is besides connected with the research department of the Royal Arsenal at Woolwich, which has devoted attention to the subject. The author's preface in itself gives in concise form an excellent statement of the present electric furnace situation. After sketching historically the development of electric furnaces and discussing the principles on which various furnaces operate, he devotes 265 pages to a consideration of industrial processes in which electric furnaces are used, such as synthesis of nitrogen compounds from air, smelting of iron ores, and non-ferrous metallurgy. Among other things of particular interest are the discussions on refractories, heat losses, temperature measurement, electrode dimensions and terminal design. The twenty-three-page bibliography on electric furnaces, processes involving them and related subjects constitutes a valuable appendix.

News of the Industry

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields With Announcements and Reports of Association Meetings and Conventions

Demonstration of Shore-to-Ship Two-Way Radio Conversation

TWO-WAY radio-telephone conversation between the shore and ships at sea using the ordinary commercial telephone instrument was successfully demonstrated this week. President H. B. Thayer of the American Telephone & Telegraph Company was able to converse from his home at New Canaan, Conn., with the captain of the steamship America, 370 miles out at sea. Messages from the ship were received at the Deal Beach (N. J.) station of the telephone company, while messages to the ship were sent to the Elberon (N. J.) station and thence to the ship. In this way it was possible to carry on a two-way conversation. Similar tests have been going on for some time.

Harding Demands Coal Wage Conference by Operators and Miners

PRESIDENT HARDING injected a new note into the coal wage controversy this week when he insisted that the coal operators and miners abide by the terms of their last year's agreement and get together in conference before taking any drastic action. The union leaders have agreed to this provided there is a national conference. They are opposed, however, to state or district parleys. Internal dissension in the union, however, may break down the demand for a national conference.

The miners are voting this week on the question of calling a strike on April 1. Only early returns were in as this was written, but these, it is reported, are almost solidly in favor of going out.

Bad Faith by Hydro Commission Charged

IN PRESENTING his resignation to Premier Drury of the Province of Ontario, Dougall Carmichael, minister without portfolio in the Drury government and for two years a member of the Hydro-Electric Power Commission of Ontario, charged bad faith on the part of the commission with the provincial government. After making a statistical review of Chippawa expenditures in the Ontario Legislature on March 3, Colonel Carmichael announced the latest expectation of cost for units to be $69,000,000.

"I gave these figures last spring in good faith," he said, referring to the estimate of $55,000,000 he had brought forward in 1921. "When it came to my attention early last autumn that these figures were liable or sure to be exceeded, I brought it to the attention of the government, and I told the Prime Minister that my commission had either been inefficient or had been dishonest in dealing with the government in regard to this development."

Sir Adam Beck, who is ill, has not yet been heard from, and Premier Drury in a brief statement to the ouse on the matter indicated the determination of the government to find out what was wrong in connection with Chippawa estimates and expenditures. He deemed Mr. Carmichael's course to have been an honorable one, stating that the government had not as yet considered the resignation of the minister from the commission.

Rate Confusion Would Exist if Commission Were Abolished, Says McCardle

SHOULD the Indiana Public Service Commission be abolished, John W. McCardle, chairman of the commission, recently told the Indianapolis Republican Club, the rates of one or more utilities in at least 1,200 cities and towns would at once be the subject of controversy, while rates outside incorporated towns would be subject practically to no wish but that of the utilities themselves. He said that before the Legislature created the commission public utilities in nearly every town were the footballs of local politics and that there were great disparities in rates. He showed that no city or town is so well equipped to get at the facts of utility rates as is the commission, with its expert accounting, engineering and other divisions. He said that such service, if it were not for the state commission, could be obtained only at great cost by the cities or towns.

Would Create Commission to Settle Muscle Shoals Problem

CREATION of a Muscle Shoals commission empowered to straighten out government tangles as to existing contracts and enter into either a sale, a lease or a construction arrangement is favored by Chairman Kahn of the House military affairs committee. Such a commission would, as its first objects, insure the production of nitrates for war purposes and the production of fertilizers for the farmer in peace time, Mr. Kahn believes. In all probability the creation of such a commission will be one of the outstanding features of the report of the committee. This intimation was contained in an interview with a representative of the ELECTRICAL WORLD and afterward given to the daily papers through the Associated Press.

"Congress has four times refused," Mr. Kahn said, "to vote appropriations for Muscle Shoals, and the committee must take the attitude of Congress in that respect into consideration on Mr. Ford's offer, which requires that there shall be appropriations of from $45,000,000 to $50,000,000. Congress spent seven years in working out a fixed public policy in regard to the development of water powers and in fixing rules and regulations under which the rights of the people are to be safeguarded, and in Mr. Ford's offer for Muscle

Shoals he asks that he be exempted from the operation of the existing federal water-power act, so that the committee must also take that into consideration.

"Again, although the Alabama Power Company relieves the committee from the necessity of asking Congress to appropriate money, in that the power company undertakes to complete the Wilson Dam at its own expense, its investment being estimated at about $25,000,000 or $30,000,000, nevertheless the Alabama Power Company, although it proposes to furnish free power to the government for the manufacture of fertilizer, does not itself guarantee to make fertilizer, and our farming population is looking forward to such a guarantee in anything the committee recommends as a possible means of reducing the farmer's fertilizer bill and with the hope of reducing the cost of living.

"Finally, the Engstrum offer also requires heavy government expenditures and would require the committee to ask Congress for big appropriations.

"This Congress is avowedly an economy congress, and we have all undertaken to adhere sincerely to the administration policy of cutting out every possible appropriation.

COMPLICATION BY EXISTING CONTRACTS

"Aside from these points, we have to deal with the difficult situation that the Air Nitrates Corporation and the Alabama Power Company have contracts with the War Department, and we know from the statements of counsel of these companies before the committee that, whatever rights these companies have under these contracts, irrespective of the opinion of the Judge Advocate General's department of the army that they are nonenforceable, these contracts will certainly be taken into the courts, dragging their weary way through court after court, until some day the Supreme Court will settle the question of the rights involved either for or against the government. The committee must take this into consideration, and it would be most difficult for us to report to Congress that we have decided upon a course of procedure which would involve long litigation and thus defeat the very object desired, namely, the completion and operation speedily and with the least delay of the Muscle Shoals project.

"Contracts must be adjusted which are already in existence, and new contracts must be made, all of which is a subject of negotiation, and not at all a suitable piece of work for either a committee of Congress or the full membership of Congress in debate.

"In these circumstances general legislation giving the necessary authority to executive and administrative officers of the government might be the wisest policy for Congress to pursue. If Secretary Weeks had had this authority, especially the particular authority to sell real estate, the present difficulties of Congress in regard to Muscle Shoals might have been avoided.

"It would seem that the logical thing to do would be for Congress to create a Muscle Shoals commission, consisting of representatives of each of the three executive branches of the government which will be involved in the Muscle Shoals project in the future—namely, the War Department, because of the necessity of nitrates for explosives; the Department of Agriculture, because of the necessity of fertilizers for the farmer, and the Treasury Department, because of the large financial considerations involved. Such a commission ought to be clothed with full powers to adjust present contracts and enter into new ones so that the government and the people may get the utmost possible benefit of the largest water power in the South as one of the country's greatest natural resources. For the military affairs committee of the House to try to solve this problem in any other way might lead to nothing being done by Congress, because upon the two questions of an appropriation for Muscle Shoals and safeguarding the interests of the people under the present water-power act Congress has repeatedly expressed its attitude."

Industrial, Manufacturers' and Utility Engineers to Confer

TO AFFORD an opportunity for mutual discussion of practical problems jointly confronting electric service companies, the electrical manufacturers and the industrial consumers of electricity, the Pittsburgh Section of the American Institute of Electrical Engineers has arranged a meeting for March 15 at which a symposium will be presented on "Operation and Maintenance of Industrial Electrical Installations." The following papers will be presented: "Electricity in and Around a Coal Mine," by H. J. Nelms, general superintendent for the New Fields By-products Coal Company; "Electrical Problems in the Department Store," by E. R. Roberts, mechanical superintendent for Kaufmann's; "Factors Governing Maintenance Policies for Industrial Electrical Apparatus," by A. C. Cummins, electrical superintendent for the Duquesne Works, Carnegie Steel Company.

Each speaker is an expert in his line, having had intimate and practical experience with the operation of electrical apparatus. The papers will be followed by discussions from other operators, manufacturers and central-station men. The entire Pittsburgh district is being actively canvassed with a view to bringing this meeting before a large number of practical men.

The meeting will be held at 8 p.m. in the Chamber of Commerce auditorium, Pittsburgh. E. C. Stone, assistant to the general manager of the Duquesne Light Company, is secretary of the section.

Overhead Systems, Sales and Auditing Topics at Wisconsin Meeting

SPECIAL attention will be paid to overhead systems, electric sales and auditing at the annual convention of the Wisconsin Electrical Association to be held in Milwaukee at the Hotel Pfister, March 22 to 24. Group meetings will be devoted to discussion of these subjects during the afternoon of the first day and the morning of the second. There will be exhibits by manufacturers and jobbers. The afternoon of March 23 will be devoted to a joint session with the Wisconsin Gas Association on matters of regulation.

Overhead railway crossings, safety code, rural extension and general legislation are to be discussed at the last morning session, and at the afternoon session the following general program has been arranged: "More and Better Business," by Milan R. Bump, president National Electric Light Association; "Value and Cost of Rural Electric Service," by A. Meyers, University of Wisconsin; "Economy in Design of Rural Extensions," by Fred J. Singer, University of Wisconsin; "Trend in Indoor Lighting and Street Lighting," by Earl A. Anderson, National Lamp Works of General Electric Company.

Efficient Operation of Little Avail in Depreciated Plant

UNLESS the voters of the town of Wakefield, Mass., decide to put nearly $4 per capita of population into plant rehabilitation this year, the most efficient management will have but little effect upon finances, according to a recent exhaustive report by the municipal light board. It is estimated that $52,250 must be expended on the gas plant and on the gas and electric distributing systems to modernize them, and the board frankly states that if the town fails to make the necessary improvements, the commissioners "consider that continued municipal operation with antiquated machinery and inadequate distributing systems cannot be a success." The time has come for the town to provide the means of serving new customers, thus reducing the operating cost through quantity production, or to discard municipal ownership.

Wakefield's municipal lighting troubles have attracted much attention in public utility circles of late. In 1921, after the town had decided to retain public ownership another year, C. W. Whiting was engaged as manager of the lighting department. The commission's report gives Mr. Whiting credit for highly efficient work in the face of obstacles. Depreciated plant, however, is a severe handicap. The town purchases energy from the Edison Electric Illuminating Company of Boston, last year's delivery being 1,104,508 kw.-hr. at a total operating cost of 3.577 cents per kw.-hr., and the town sold to consumers 882,646 kw.-hr. at a total cost delivered of 8.32 cents per unit. The net price of electricity throughout the year was 13 cents per kw.-hr.

More Than 1,500 Stockholders Attend Commonwealth Edison Meeting

AT THE annual meeting of the stockholders of the Commonwealth Edison Company on Feb. 27 more than 1,500 were present, the largest number of stockholders ever assembled at Customers' Hall. The interest shown was thought to augur well for the customer-ownership movement. The board of directors was authorized to increase the capital stock from $60,000,000 to $80,000,000.

The annual report of the company shows that in 1921 62,200 new customers were added to the company's lines, bringing the total number served at the end of the year up to 536,982. While unsatisfactory conditions prevailed throughout the year in many lines of business, the increase was greater than in any other year of the company's existence. The electrical load also showed an increase, since the maximum carried was 525,640 kw. as against 478,820 kw. for 1920. Operating revenue in 1921 was $37,139,830, as compared with $35,317,134 in 1920.

With this increase in business and some reductions in operating expenses, a net earning of $5,366,785 was obtained, equal to a return of 9.89 per cent on an average capital stock of $53,839,075. This compares with 9.52 per cent earned in 1920 and 9.84 in 1919. This rate of return was obtained with an operating expense in 1921 of $24,396,155, as against a similar cost of $24,697,000 in 1920. State taxes increased $600,000 during the year. Because of the issuance of new capital in four installments, the company had the use of its full capital of $55,465,000 less than two months of the year. The working capital at the end of 1921 was $1,889,363, compared with $3,266,206 at the end of 1920. During the year the company reduced its loans and notes payable to the extent of $1,200,000.

President Asks for $50,000 More for Enforcement of Radio Laws

THE Senate has received from President Harding a request for a supplemental appropriation of $50,000 to deal with an emergency caused by rapid increase in radio broadcasting. The appropriation, in addition to the $80,000 already authorized, would be for enforcement of the wireless communication laws. Accompanying the President's request was a letter from Secretary Hoover stating that the Department of Commerce's force was entirely insufficient to cope with the emergency of radio broadcasting. A conference called by Secretary Hoover is now considering remedial measures.

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LEGISLATORS AND TECHNICIANS AT RADIO CONFERENCE

(Left to right, front row)—Secretary of Commerce Hoover, Postmaster-General Will Hays, General George O. Squier, Congressman W. H. White of Maine, former Congressman Shirley. (Back row)—Dr. Louis Cohen, consulting engineer for the War Department; Prof. C. M. Jansky, Jr., Edwin H. Armstrong, Columbia University; Harry F. Breckel, Dr. Alfred Goldsmith, New York City.

Conference Held on Overhead-Wire Crossing Specifications

A LARGE and representative conference met in New York on March 2 to consider the question of uniform specifications for crossing of overhead wires and to dispose, if possible, of certain differences of opinion in regard to Part 2 of the National Electrical Safety Code, which deals with overhead lines. The conference was called by the American Engineering Standards Committee at the request of the American Electric Railway Association.

The conclusions of the conference are expressed in the following resolution, which was passed unanimously:

Resolved, That it is the opinion of this conference that:

(1) The remaining differences of opinion on Part 2 of the National Electrical Safety Code are small, and the different interests are approaching agreement, and that it is therefore advisable:

(2) That the National Electrical Safety Code should be approved by the American Engineering Standards Committee with the understanding that:

(3) There should immediately be organized a thoroughly representative sectional committee under the procedure of the American Engineering Standards Committee to con-

sider any revisions of Part 2 of the code which may be deemed necessary by any of the interested parties, and

(4) That there should be a set of national specifications for crossings between overhead electric wire lines and railways and between different wire lines, because there is disagreement among existing specifications, and that

(5) Such specifications should be prepared by thoroughly representative sub-committees so as to make them in agreement with the code, with such revisions as may be made under the provisions of paragraph 3 above.

WIDE DIVERSITY OF INTERESTS REPRESENTED

The American Electric Railway Association presented a statement outlining the considerations which had led it to request the conference and stating in general terms its position on the various items of the agenda. This was followed by a statement by W. A. Durgin in regard to the general work of the Department of Commerce in promoting simplification in industry and industrial standardization along national lines. Dr. M. G. Lloyd, on behalf of the Bureau of Standards, then outlined the development of the National Electrical Safety Code and its present position before regulatory bodies and utility companies and associations.

The following representatives of state commissions briefly outlined the points of view of their respective bodies: A. E. Knowlton, Connecticut Public Utilities Commission; A. B. Campbell, Iowa Board of Railroad Commissioners; D. F. Jurgensen, Minnesota Railroad and Warehouse Commission; W. C. Whiston and F. G. Daniell, New York Transit Commission; C. R. Vanneman, New York Public Service Commission, and W. C. Bliss, Rhode Island Public Utilities Commission.

John Murphy, electrical engineer on the Board of Railway Commissioners, Ottawa, Canada, representing his commission and the Canadian Engineering Standards Association, outlined the status of crossing specifications in Canada.

More than fifty representatives were present at the conference, all the principal interests sending delegations. In addition to the state commissions and the Canadian bodies already mentioned the following bodies were officially represented: American Electric Railway Association, American Institute of Electrical Engineers, American Railway Association, American Telephone & Telegraph Company, Bureau of Standards, Electrical Manufacturers' Council, Federal Power Commission, Hydro-Electric Power Commission of Ontario, National Bureau of Casualty and Surety Underwriters, National Electric Light Association, National Safety Council, Postal Telegraph-Cable Company, United States Department of Commerce, United States Department of Labor, United States Independent Telephone Association, Western Association of Electrical Inspectors and Western Union Telegraph Company.

Radio Show Draws Crowd

TO WHAT extent the public interest in wireless has grown in the past year was plainly evidenced on Tuesday night when the annual Radio Show opened at the Hotel Pennsylvania, New York. Thousands stormed the doors, and more people were turned away the first night than attended during the entire week last year. In previous years the Radio Show has been of interest almost entirely to amateur radio operators.

A great many new devices were displayed by the manufacturers and numerous interesting radio applications were demonstrated.

Recommends New York to Build Power Plant to Supply Municipal Needs

THERE was placed before the New York City Board of Estimate last week by the Commissioner of Plant and Structures a recommendation that the city erect a 12,000-kw. municipal electric plant on Staten Island to supply energy for municipal ferries, street cars and piers. The estimated cost is $1,235,000. At the office of the commissioner it was stated that the city was forced to take this step because the local power company, the Richmond Light & Railroad Company, did not have sufficient capacity to meet the city's requirements.

Electrical Power the Best for Oil-Well Operations

THAT the electric motor is better than the steam engine in pumping oil wells because of its greater flexibility of control and higher hoisting speeds, and is far better than the oil or gas engine, was asserted by W. F. Barnes in discussing the adaptation of electrical apparatus to the oil industry before the engineering congress on the petroleum industry held at Kansas City this week under the auspices of the Engineers' Club of Kansas City and the local section of the American Society of Mechanical Engineers. Lower upkeep cost, longer life and greater reliability under all weather conditions are important factors in the superiority of electrical over other types of power equipment, Mr. Barnes said.

Even in the fields that have a plentiful gas supply it is cheaper to use the gas to generate electricity to supply motors for the individual pumps than to apply the gas engine directly to the pumping equipment. Individual motor-driven jacks employing 3-hp. to 5-hp. motors are used for wells up to 1,500 ft. in depth, and Mr. Barnes said that there was no doubt that this method would extend to deeper wells. The application to deep wells is more complicated because during 95 per cent of the time there must be efficient operation at a constant speed and for 5 per cent of the time the motor must handle a very severe hoisting load in pulling tools, rods and casing and perhaps in swabbing and drilling. While the steam engine is ideal from the operator's standpoint, from the producer's viewpoint it is not economical because of the necessity of supplying a boiler plant for each six wells and because of the attendance and the cost of frozen steam lines in the winter.

In discussing the subject of drilling, R. M. Stuntz estimated a saving of from $2,100 to $6,000 per well by the use of electric power. Constancy of the power supply and the elimination of expensive measures to obtain the proper water supply for use in boilers were to him the two most important factors.

In the discussion of Mr. Barnes' paper it was stated that data from 2,000 to 3,000 wells operated by electric power showed an increase in production over other methods of 15 per cent. On 2,500-ft. wells 10 kw.-hr. to 12 kw.-hr. per foot will be required in drilling operations, and it was asserted that the electrical equipment could be scrapped after the drilling of the first well and a profit could still be shown. In one case of seventy-two wells a saving of $1.12 per day over steam pumping was effected.

Plans Being Made to Increase Carolina Power & Light Capacity

THE Carolina Power & Light Company interests have organized the Carolina Power Company for the purpose of financing extensions to property so as to be able to supply adequately the territory served. Just how this is to be accomplished has not been determined. There is the possibility that a plant may be built on the Pee Dee River, along which the parent company is known to own power sites. Tne site is at Swift Island, and in all likelihood if any hydro-electric work were undertaken the plant here would be the first to be built. A 100-ft. dam at this site, it is understood, would give a plant capacity of 35,000 hp. This site was secured by the company in 1916, a survey made and riparian rights obtained. It is understood that the war prevented development at that time.

New Jersey Distribution System Being Converted to Three-Phase, Four-Wire

THE Public Service Electric Company of New Jersey is undertaking the conversion of its state-wide distribution system to three-phase, four-wire, T-connected, 4,000 volts between phases. At present the distribution is chiefly two-phase, four-wire, although some single-phase, two-wire circuits are included. Sixty-five substations will be involved in the change. By the conversion it is expected to benefit in the following manner: More power can be conducted for a given weight of copper, line losses at the increased load will be reduced, voltage regulation will be better, and the area of economical service will be extended.

Conversion to three-phase operation will be made gradually during periods of no load. One feeder will be changed at a time. At present T-connected transformers are used in the substations. Each of these banks will be duplexed and connected in delta-star with two other units. Four-pole switches now used on the two-phase circuits will be used for the three-phase, four-wire system. The single-phase circuits will be connected in pairs to give four-wire, three-phase circuits. New stations will have only three-pole circuit breakers per circuit.

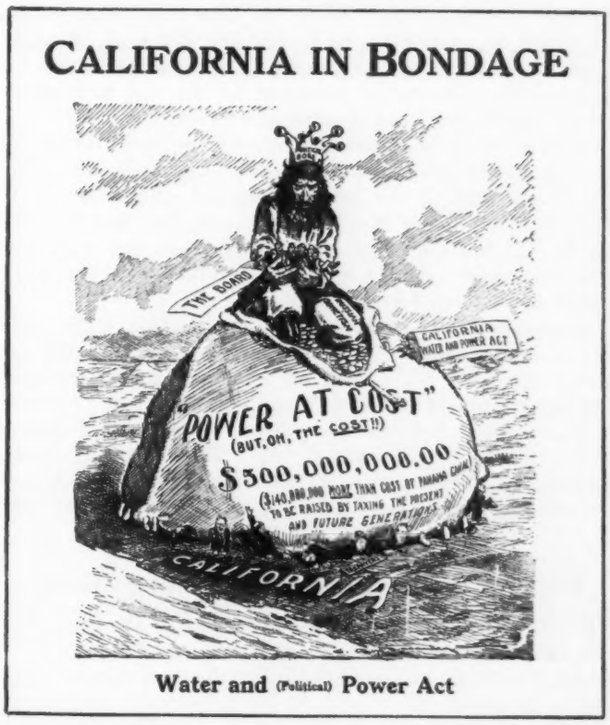
Portland (Me.) Company Seeks to End Direct-Current Service

PERMISSION gradually to do away with direct-current distribution in the city of Portland, Me., is sought by the Cumberland County Power & Light Company in a recent communication to the Maine Public Utilities Commission. Such service covers only a limited area from the old Plum Street generating plant, now a substation only, and three fully loaded 500-kw. motor-generator sets without reserve for breakdown are handling the business. A separate set of 125-250-volt, three-wire direct-current feeders is required in this section despite its being adequately covered in the main by alternating-current lines. These low-tension feeders are also heavily loaded and voltage conditions are unsatisfactory.

In a letter to the commission Fred D. Gordon, general manager, states that it is the company's intention to furnish no more direct-current service except for railway operation after 1931, and that on and after March 15, 1922, no new direct-current customers will be accepted. Direct-current service to old customers is being discontinued, with temporary exceptions, in the present direct-current district. The company proposes to pay certain costs of changing to alternating-current service. These include bringing alternating-current service wires to the customer and the following compensation for changed equipment, based on its present value:

The company will pay the present value of the direct-current equipment changed by taking its cost new (estimated or agreed upon in the absence of actual record) and deducting therefrom the salvage value, to derive the service value. The number of years of the equipment's service will then be ascertained and its future useful life estimated. The per cent condition will be the ratio of the remaining years of useful life to the total (past plus estimated future) life of the equipment. To the scrap value will be added the service value multiplied by the per cent condition, in order to derive the present value. The customer will make the necessary wiring and equipment changes at his own expense. In case of equipment where the cost of exchange would be prohibitive the company may at its option furnish to the customer a suitable motor-generator set to operate that portion of the direct-current load on which the change-over costs would be prohibitive. This motor-generator set will become the customer's property and is to be installed, wired and operated at his expense.

War in Earnest Over Proposed California Water-Power Act


CALIFORNIA IN BONDAGE
THE BOARD
CALIFORNIA WATER AND POWER ACT
"POWER AT COST"
(BUT, OH, THE COST!!)
$300,000,000.00
($140,000,000 MORE THAN COST OF PANAMA CANAL)
TO BE RAISED BY TAXING THE PRESENT AND FUTURE GENERATIONS
CALIFORNIA

Water and (Political) Power Act

SUPPORTERS of private operation of public utilities have taken the fight on the proposed California water and power act to the people. A pamphlet entitled "California in Bondage" and containing a brief digest of all the important facts has been mailed to every voter. The proposed act is really an amendment to the state constitution and will be submitted to the voters at the November election. The amendment is aimed to secure to the state control, operation and development of all water powers.

Mansfield and Ashland Utilities Purchased by Ohio Public Service Company

AUTHORITY for the Ohio Public Service Company, a Henry L. Doherty holding company, to purchase the properties of the Richland Public Service Company of Mansfield, Ohio, and the Ashland Gas & Electric Company of Ashland, Ohio, was granted by the Ohio Public Utilities Commission on Feb. 15. The Ohio Public Service Company received permission to issue $1,991,000 in common stock, $2,350,000 in bonds to be sold at not less than 83, and $3,037,000 in bonds to retire bonds of the companies acquired.

Permission had been sought by the Ohio company to issue its securities on a basis of $9,087,000 valuation, but the commission recognized the present value of $6,986,500 and permitted securities to be issued on this basis. The Ohio company had also asked authority to issue $3,200,000 common stock and $500,000 preferred stock, but the commission rejected the preferred-stock request and reduced the amount of common stock.

Electric Utilities Paid $5,800,000 Federal Taxes in 1919

OF THE 1,603 electric light and power companies making income-tax returns for 1919, 454 had no net income whatever, according to figures just compiled by the Bureau of Internal Revenue. Among 1,046 light and power companies it was found that the net income was 6.53 per cent of the invested capital. The total net income of 1,149 such utilities in 1919 was $49,515,624, on which an income tax of $4,639,440 was paid, in addition to war-profits taxes and excess-profits taxes of $1,164,563. The deficit reported by the 454 companies which reported no net income was $4,360,909.

According to the bureau's figures, the net income of all transportation and other public utilities is shown to have been 6.38 of the invested capital. For the steam railroads the figure was 4.78 per cent, for electric railroads 4.11 per cent, for ocean lines 23.46 per cent, for gas companies 6.07 per cent, and for telephone and telegraph companies 7.01 per cent.

Federal taxes of $5,804,003 on electric light and power companies in 1919 compare with $1,214,980 on gas companies, $8,787,106 on telephone and telegraph companies and $873,440 on waterworks.

There were 242 electric railways which reported a total net income of $28,387,311. Their total tax was $3,126,002. There were 196 electric railroads which had no net income. Their deficit is shown as $10,860,272.

Illinois Utility Properties Reorganized

THE heating and electric properties in De Kalb and Sycamore Counties in Illinois formerly operated under the name of the DeKalb-Sycamore Electric Company, including the power stations formerly owned by the DeKalb-Sycamore & Interurban Traction Company and leased to and operated by the De-Kalb-Sycamore Electric Company, the Springfield Gas & Electric Company and the Springfield Consolidated Railway Company, have been acquired by purchase and merger by the recently incorporated Illinois Power Company, a Springfield concern. The obligations of the old companies, including securities and other indebtedness, have been paid off and a new first mortgage has been issued on the Illinois Power Company that is flexible as to amount and maturity and which obviates the difficulties in financing previously experienced.

Extensive improvements will be commenced this year with the putting underground of all light and power wires in the business district of Springfield and the rehabilitation of street-car lines, heating mains and the gas mains in this district incident to the entire repaving of the business section. Expenditures of $1,250,000 are estimated for this work. This reorganization represents the final outcome of the long controversy at Springfield which ended last year with the failure of the city to carry out an agreement to buy the properties and operate them with the existing municipal plant. Franchises to replace those that had expired or were about to expire were given to the company.

Annual Johns Hopkins Lectures Upon Engineering Practice

LECTURES on engineering practice are being given this month at Johns Hopkins University, Baltimore, in accordance with the yearly plan of that institution. The series this year numbers four, of which one concerned with civil engineering has already been given. On Wednesday of next week the electrical engineering field will be represented on the rostrum by C. E. Skinner, manager of the research department of the Westinghouse Electric & Manufacturing Company, whose topic is to be "Some Results of the War on Engineering Research." Mechanical engineering will furnish the subject for the following week, and chemical engineering the subject for the week after that.

New York Court of Appeals Sustains the Legality of Service Charge

THE legality of a monthly service charge by a public utility, which has been before the New York State courts for some months and has led to a conflict of judicial opinion, has been settled so far as that state is concerned by the Court of Appeals, the highest state tribunal, which on Feb. 28 handed down an opinion in the suit of the People against the Rochester Gas & Electric Corporation sustaining the right of the company to make such a charge. This decision is of far-reaching effect and probably means that electric as well as gas companies will be permitted to make a service charge in New York State and that rebates will be discontinued.

The Rochester corporation obtained permission from the old Public Service Commission, Second District, to make the service charge of 40 cents per month to each consumer, in addition to the rate of $1.30 per 1,000 cu.ft. of gas, by orders granted July 1 and Oct. 14, 1920. The legality of the orders of the commission was presented to the Appellate Division, Third Department, as a submitted controversy, and the court ruled that the charge was in effect a rental charge for a gas meter, which is prohibited by law, and that a charge for "service" was the imposition of a higher rate for gas.

The Court of Appeals has now reversed the Appellate Division's ruling and directed judgment for the gas company in refusing an injunction to restrain collection of the service charge.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest

New Orleans' New Power Plant.—The Citizens' Light & Power Company has been organized with a capital of $2,000,000 to erect a new electric light and power plant in New Orleans, and it has been announced that the first unit will be ready within four months.

Municipal Plants in Utah Subject to Commission Control.—The Attorney-General of Utah has advised the city attorney of Logan, in response to a query, that a municipal corporation operating its own electric plant is a public utility subject to the jurisdiction of the state commission.

American Welding Society Issues "Proceedings."—Vol. 1, No. 1, of the *Proceedings* of the American Welding Society is out, bearing date of January, 1922. It contains forty-four pages, containing information and news concerning the society in addition to technical papers and reports. W. S. Sparagen is the editor.

Hydro-Electric Plant May Be Built in Camden County, Mo.—Plans are being discussed for the construction of a 30,000-hp. or 40,000-hp. hydro-electric plant near Linn Creek, Camden County, Mo., by the Osage Power Development Company, at a cost of several million dollars, according to a special dispatch from the correspondent of the *Manufacturers' Record* at Lamar, Mo.

Wireless Between France and Argentina.—A French engineering company has been granted a concession by the Argentine government for the erection and working of a wireless station for direct communication with France. The concession is for a period of thirty years, and the company is allowed three years for preparation before commercial service is demanded. By the terms of the agreement the company's wireless messages will be forwarded over the state telegraph lines and the rates of messages will be fixed by the national government.

San Antonio Ceases to Rely on the Moon.—Like nearly all the other larger cities in the country, San Antonio, Tex., has ceased to rely upon the moon to help cut its lighting bills. Until March 1 the city's illumination was provided under the moonlight schedule; that is, when the moon was at the full the lights were cut off. Now the city has planned to substitute one electric arc lamp in place of two gas lamps and also to substitute arc lamps for other electric units and hopes thus to be able to maintain artificial lighting every night regardless of the moon and the weather. The rate per arc lamp per month will, if the proposed new contract is ratified, be increased by the San Antonio Public Service Company from $4 to $4.50. More than 800 arc lamps will be used.

A "Fused Wire" Did It Again!—A great fire recently took place at Hartlepool, England, and the newspapers hastened to explain that it had its origin in "the fusing of an electric wire." Competent men have investigated the fire and found no basis whatever for such an assertion. Yet, says the *Electrical Times*, it would be quite futile to try to correct this reportorial verdict. The incriminatory phrase is "burned into the reporter's brain."

New Oklahoma Power Plant Opened.—The new 10,000-kw. plant of the Oklahoma Power Company, near Tulsa, was formally opened on Feb. 17. It is connected with the power plant of the Public Service Company in Tulsa by a conduit laid under the river and also by overhead cables. A transmission line carrying 13,200 volts leads south from the plant, which is stepped up to 66,000 volts and connected with transmission lines of the Oklahoma Gas & Electric company, furnishing energy for Sapulpa, Broken Arrow, Drumright, Kiefer, Mounds, Beggs and Muskogee. The plant is also connected with the power plants of the Okmulgee Ice & Light Company and the Henryetta Electric Light Company.

Scottish Highland Water-Power Projects Up Again.—The Grampian and Loch Doon hydro-electric plans, which failed of authorization last year, are to come up again, with modifications, at the present session of the British Parliament. The Grampian scheme is of especial interest, according to the London *Electrician*, because it would be the first British hydro-electric development to rely exclusively upon water power for the generation of electricity for bulk supply to authorized distributers. The Loch Doon proposals are of a more modest character, being concerned with the supply of power to Ayr. The salmon fishing proprietors and riparian owners are the chief opponents of the hydro-electric development of Highland waters.

Europe's Largest Power House.—What will be, it is said, the largest power house in Europe is under way at Gennevilliers, Paris, where the Union d'Electricité has its new central station. There are to be eight turbo-generator units rated at 40,000 kw. each, the first of which is now in operation, while work is proceeding on four others. Current is generated at 6,000 volts and transmitted at 66,000 volts. The switchgear is of the open-air type, though a light roof has been erected to exclude dust. Three different firms, two French and one Swiss, have, says the *Electrical Times*, built the machines, which are noteworthy for their great compactness. The whole electrical load of Paris will eventually be handled from three central stations, of which the one at Gennevilliers will be the chief.

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month

O. E. L. A. to Meet at Cedar Point in July.—The executive committee of the Ohio Electric Light Association has fixed upon July 11-14 as the date for the annual convention at the Breakers Hotel, Cedar Point. The committee has decided to have an exhibit at this convention.

Association of Iron and Steel Electrical Engineers.—The New Auditorium at Cleveland has been selected for the 1922 convention of this association, which will take place on Sept. 11 to 15. The auditorium, which has 35,000 sq.ft. of floor space, equipped with power, offers an opportunity to exhibitors to display machinery in operation.

To Discuss Safety Rules at Utilities Convention.—A course of instruction on the best and safest standards of construction for telephone, telegraph, electric light and power lines will be conducted in connection with the fourth annual convention of the Oklahoma Utilities Association, at Oklahoma City, March 14, 15 and 16, by Dr. M. G. Lloyd, electrical engineer of the United States Bureau of Standards. Dr. Lloyd will explain to the utility operators the application of Corporation Commission Order No. 1946, dealing with that subject. He will also give a history of the National Electrical Safety Code, and a representative from each of the telegraph, telephone and electrical industries will also discuss the subject.

Coming Meetings of Electrical and Other Technical Societies

A. I. and S. E. E. Section Meetings—Cleveland, March 13; Chicago, March 15; Pittsburgh, March 18; Youngstown, March 25; Birmingham, March 25.

A. I. E. E. Section Meetings—New York, March 15; Pittsburgh, March 15; Schenectady, March 17.

Associated Manufacturers of Electrical Supplies—New York, March 13-17. (For program see issue of March 4, page 447.)

Oklahoma Utilities Association—Oklahoma City, March 14-16.

Illinois State Electric Association—Chicago, March 15-16.

Wisconsin Electrical Association—Milwaukee, March 22-24. (For program see issue of Jan. 14, page 96.)

A. S. M. E. Spring Meeting—Atlanta, April 8-11.

Tri-State Water and Light Association—Spartanburg, S. C., April 19-21.

American Physical Society—Washington, April 22.

American Electrochemical Society—Baltimore, April 27-29.

N. E. L. A. Annual Convention—Atlantic City, May 15-19.

N. E. L. A. Geographic Divisions—Southwestern, San Antonio, May 3-6; Pacific Coast, Los Angeles, May 31-June 3; Northwestern, Boise, June 7-10; North Central, St. Paul, June 13-15.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities

Surcharge Continued.—The Northern Indiana Gas & Electric Company has been authorized by the Public Service Commission to continue to make a surcharge of 20 per cent on all bills for electricity in Lake County over $100. The order will stay in effect until June 27, 1923.

Declining Prices of Material in Their Relation to Rates.—Upon a showing that the cost of copper-wire base, electrolytic copper and scrap copper had materially decreased since the filing of a petition by the Prairie Electric Company for increased electric rates, the Illinois Commerce Commission refused to approve the application until an affirmative procedure should show that existing rates are unjust, unreasonable and insufficient for future operation.

How Special Conditions Affect Depreciation.—In granting increased rates to the Gays Mills Electric Company the Wisconsin Railroad Commission dwelt on two circumstances which necessitated a higher allowance for depreciation than would ordinarily be the case in a plant of the same character as the one concerned. One of these circumstances was that the company did not own the dam and could not benefit by the low rate of depreciation usually characteristic of such structures, and the other was that the company had an oil-power auxiliary and that the life of oil-engine units is generally quite short, though in the case in question they were to be used for such short periods in the year that the depreciation should be less than the normal.

Reductions in Milwaukee Rates.—The Wisconsin Railroad Commission, investigating the electric rates of the Milwaukee Electric Railway & Light Company and the Wells Power Company to see if a reduction from those fixed in December, 1921, could be made, found that coal costs had decreased, that during the first eleven months of 1921 there was available about $236,000 in excess of a full return on utility capital for the department, that the cost of power will be reduced somewhat below the average for that eleven-month period, and that the labor costs will be reduced, and therefore prescribed revised schedules providing for decreases in rates, which, together with a revised municipal rate schedule, the commission estimated would bring about the following reductions in annual revenue: Commercial lighting, $168,000; residence lighting, $137,500; municipal lighting, $118,500; increment power, $140,000. Replying to criticism made of the reduction in the municipal schedule on the ground that if this reduction were made there would be a material discrimination against customers supplied on other schedules, the commission said: "It should be remembered, however, that in this rate the cost of energy is a much more important component than in the rates for small residence and store-lighting use. In these schedules the other expenses of furnishing the service are relatively much greater so that a change of a given amount in the cost of energy would not have the same relative effect upon the schedule as it would have upon a schedule for large power or street-lighting use. Our conclusions, however, from our study of this case are that if there were to be no modification of the rates for small retail use of energy there would be a discrimination inasmuch as such rates have been based on a cost of coal not now existing and which is not now applicable in the charge for energy to the larger customers. With the modifications, however, which will be made by the order in this case we find that there is no unreasonable discrimination remaining."

Discrimination Between Localities.—Protestants against the rates of the Dixie Power Company contended before the Utah Public Utilities Commission that the company's rates were in excess of those imposed in some other parts of the state. Admitting this, the commission said: "Rates must be based upon the cost of service. Cost of service in turn depends upon the investment necessary to render said service. Investment varies with location, and particularly so with hydro-electric properties. Thus, before a comparison of rates may be made or relied upon, it is necessary to ascertain first whether the conditions and costs of rendering service are similar, and, unless the conditions are analogous, the fact that other companies in other localities charge rates higher or lower than those complained of would shed no light on the reasonableness of the rates under consideration. Further, it would be necessary to determine, first, whether or not the rate selected for comparative purposes in some other locality was a compensatory rate as applied to its own utility. For example, we have found the present rates of applicant to be confiscatory. If these same rates were used for comparative purposes, without a knowledge of their confiscatory character, it would lead to an absurd conclusion if applied to similar property. A comparison of rates may give information in a very general way, but for reasons heretofore outlined cannot be controlling. In this particular case we have a sparsely inhabited territory over which the company has extended its service, and it must be apparent to even the casual observer that the cost of service to the consumer must necessarily be higher than in sections where conditions are more favorable."

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies

Municipality Cannot Compel Free Service.—In United Fuel Gas Company vs. Public Utilities Commission, the Ohio Supreme Court, while sustaining the commission and the city of Ironton in the contention that the city had the right to establish gas rates by ordinance for the remainder of a franchise term, declared that a provision requiring the company to furnish service free for certain municipal purposes was beyond the powers of the City Council. (132 N. E. 845.)*

Arizona Statute Regulating Transmission Lines Invalid.—In Pacific Gas & Electric Company vs. State, the Arizona Supreme Court has held void a statute of the 1915 Legislature relating to the erection and maintenance of telephone, telegraph, signal, trolley and electric light and power lines, in view of the fact that the Corporation Commission had previously exercised the power granted it by the constitution, and issued a general order concerning this matter. (201 Pac. 632.)

Commission's Decision in Specific Case Where Discrimination Was Charged Did Not Involve Reasonableness of Rate Schedule.—In Utah Copper Company vs. Public Utilities Commission of Utah, in which the Supreme Court of Utah sustained the commission in its abolition of contract rates held to be discriminatory (see issue of Dec. 31, 1921, page 1338), it was adjudged that in a proceeding before the commission involving the issue as to whether rates at which a company was furnishing power to a particular consumer were discriminatory, this proceeding being held concurrently with a proceeding on the company's application to increase rates, the commission properly refused in the first-named proceeding to pass upon the reasonableness of the rates charged or sought to be charged by the power company. The commission, on finding the contract rate to be discriminatory, before making its order as to a reasonable rate in the other proceeding, had power to fix as a temporary rate (pending its decision in the other proceeding) the regular schedule rate at which power was being furnished to other consumers, without passing on the reasonableness of such temporary rate, with the proviso that if such temporary rate should be ultimately found excessive, the power company should make reparation. (203 Pac. 627.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Men of the Industry

Changes in Personnel—Responsibilities and Association Appointments of Men Engaged in Professional, Executive, Operating and Commercial Branches of the Industry

T. O. Kennedy, general superintendent of the Denver Gas & Electric Light Company, has been promoted to be general manager of the Ohio Public Service Company, a consolidation of all the

T. O. KENNEDY

Henry L. Doherty holdings in Ohio except those in Toledo. Mr. Kennedy, who has been a member of the Doherty staff in several capacities since his graduation from the University of Missouri in 1907, is one of the youngest men upon whom these interests have devolved such a heavy responsibility. He has been in charge of various Eastern and Southern electrical and power enterprises owned by the Doherty company, and for a time he was head of the New York construction department. In July, 1917, Mr. Kennedy was appointed general superintendent of the Denver Gas & Electric Light Company, from which position he has just been promoted. He is a past-chairman of the electric bureau of the Civic and Commercial Association of Denver and was active in organizing the Electric Co-operative League of that city. Of this league he was president. Mr. Kennedy was also chairman of the newly organized Rocky Mountain Committee on Public Utility Information, composed of virtually all the utilities in Colorado, Wyoming and New Mexico.

James H. Manning has been appointed engineering manager for Stone & Webster at their Boston headquarters, succeeding Col. Peter Junkersfeld, who recently resigned to enter private practice.

Ivar Herlitz, fellow of the American-Scandinavian Foundation and formerly with the Southern Sierras Power Company, Riverside, Cal., who has won a research scholarship from the Swedish Academy of Engineering Science, is studying high-voltage transmission problems in California.

E. B. Merriam, formerly director of industrial relations, has been appointed executive engineer of the switchboard department of the General Electric Company. As executive engineer Mr. Merriam will direct and co-ordinate the engineering activities of the switchboard department at Schenectady, Philadelphia and Baltimore. Mr. Merriam is an engineer of broad experience and has been identified with important developments in the particular field he is now entering. He holds a number of patents on circuit-interrupting and switchboard devices and was one of the pioneers in the development of outdoor substation and outdoor switching equipment, for which a model and diploma for meritorious design were awarded to him at the Panama-Pacific International Exposition. He entered the employ of the General Electric Company in 1900 as a student in the testing department. In 1903 as a member of the switchboard engineering department he was engaged in testing fuses and lightning arresters and in the investigation of short-circuit phenomena. In 1905 he entered the designing section of the switchboard department and two years later was assistant engineer in charge of design. About 1917, becoming interested in employment problems, he was appointed employment

E. B. MERRIAM

manager and director of industrial relations. During the war Mr. Merriam served on various personnel classification committees and was industrial representative in military camps.

F. B. Frost, superintendent of motive power for the New Orleans Railway & Light Company, has had the added duties of superintendent of the electrical department of the company placed upon him, with a new title of general superintendent. He will now have charge of the generating, transmission and meter department of the New Orleans company.

George E. Lewis has been appointed executive manager of the Rocky Mountain Committee on Public Utility Information, serving the States of Colorado, New Mexico and Wyoming. Mr. Lewis made an enviable record during the war period, when as director of

G. E. LEWIS

publicity for the Mountain division of the American Red Cross he did much toward standardizing that organization's publications and furthering its financial and other campaigns. He is a newspaper man and in that profession has had several years of executive experience and has been a successful feature writer. Mr. Lewis has made a special study of utilities with respect to public relations. He will make his headquarters at Denver.

E. G. MacDonald, formerly associated for ten years with the Great Western Power Company as superintendent of the steam-plant department at Oakland, Cal., has been appointed assistant superintendent of electric generation for the Los Angeles Gas & Electric Company. For the last three years he had supervision of the best and trial work for the Los Angeles Shipbuilding Company.

H. S. Cooper, formerly secretary of the Southwestern Electrical and Gas Association, has opened offices in Dallas, Tex., as an advisory engineer to electric light and power, electric railway, gas and water companies. Mr. Cooper made a reputation during his nine years as secretary of the Southwestern association and in the consulting engineering work that he carried on during a part of that time. He resumes active work after a rest taken when he resigned as secretary of the Southwestern Electrical and Gas Association last summer.

Reginald M. Campbell, well known in the electric light, power and railway and steam-railroad fields, and who has for the last eight years been identified with the Habirshaw Electric Cable Company, has resigned from that company to accept the position of special representative of the American Copper Products Company with headquarters at 200 Broadway, New York City. In his new connection Mr. Campbell will continue his activities in the fields he has specialized in for eighteen years and in which he enjoys so wide an acquaintanceship. Prior to his connection with the Habirshaw company, Mr. Campbell was associated with the Ohio Brass Company. The American Copper Products Company, whose organization he has now joined, is one of the largest producers of copper products in the country. Mr. Campbell is a member of the New England Street Railway Club and the Railroad Club and Engineers' Club of New York.

R. M. CAMPBELL

V. A. Zehr, consulting engineer, Pekin, Ill., who recently went to Europe to investigate certain construction work in Bohemia, has established an office in Brandys Labe, Czechoslovakia, for the practice of engineering. Mr. Zehr was born in Brandys Labe and came to this country in 1915. In the following five years he was with the General Electric Company, Stone & Webster, the Westinghouse Electric & Manufacturing Company and the E. T. Perkins Engineering Company.

A. B. Holcomb has been appointed district manager of the Pittsburgh office of the Corliss Carbon Company, Bradford, Pa. Mr. Holcomb was graduated from Worcester Polytechnic Institute in 1908, and after a year's experience with the West Penn Power Company at Connellsville, Pa., he spent seven years teaching electrical engineering at Cornell University and the Carnegie Institute of Technology, using the summer vacations for training and experience with the West Penn Power Company and the Westinghouse Electric & Manufacturing Company. In 1916 he left academic work to accept the position of electrical superintendent with the Standard Tin Plate Company at Canonsburg, Pa. Since 1919 he has been following consulting and sales engineering work in the Pittsburgh and Youngstown districts.

K. S. Edwards has been transferred from the Pacific Coast sales department of the Gilbert & Barker Manufacturing Company to the home office in Springfield, Mass., and will assume supervision of all retail sales activities of the company.

Louis C. Eitzen, well known in the electrical industry as a sales engineer, has established an organization with headquarters at 280 Broadway, New York, for sales promotion work. Mr. Eitzen obtained a degree of B.E.E. at Cooper Union, New York, and began his professional experience as an apprentice with the Lambert Schmidt Telephone Company, Weehawken, N. J. Later he entered the shops of the James Reilly Repair & Supply Company, New York. In 1904 he entered the employ of the William H. Bristol Pyrometer Company, being placed in charge of the manufacturing and calibrating departments. There he remained until 1907, when he became associated with the Electrical Testing Laboratories of New York, where his studies culminated in his engineering degree. From 1911 to 1917 he was a sales and electrical engineer with the Standard Underground Cable Company. During the following two years he held the position of general manager of the August Mietz Corporation, manufacturer of semi-Diesel oil-burning engines. He became vice-president and general sales manager of the oil-engine division of the Pittsburgh Filter & Engineering Corporation, with offices in New York, in 1919 and resigned that position in 1920 to become president of the Elsee Products Corporation, New York. Mr. Eitzen is an associate member of the A.I.E.E. and a member of the American Society of Testing Materials and of the Export Managers' Club.

L. C. EITZEN

Obituary

Francis J. Hovey, for fifteen years in charge of personnel matters for Stone & Webster and long in touch with the development of that organization at Boston and elsewhere, died at Hingham, Mass., recently. Mr. Hovey, who was about sixty-nine years of age, was known throughout the public utilities managed by Stone & Webster for his guidance and supervision of young men entering the organization after preliminary training outside. He exerted a far-reaching influence upon their development and progress toward posts of executive responsibility. Ill health compelled him to relinquish many of his responsibilities in the last two or three years, but he retained his active interest in the organization to the end, and during the recent convention at Boston of Stone & Webster managers telephonic arrangements were made by which he was able from his bedside to follow many of the proceedings. Mr. Hovey was an uncle by marriage of E. S. Webster of the original firm, now Stone & Webster, Inc. In earlier life he was associated with the American Bell Telephone organization.

F. J. HOVEY

J. Leake Carraway, formerly local director of public relations for the Virginia Railway & Power Company, died on Feb. 10 at his home in Norfolk, Va., after a lingering illness. Mr. Carraway was widely known by public utility men throughout the country. He was born in 1873 in Wadesboro, N. C. After several years in newspaper work he became executive secretary of the Charlotte Chamber of Commerce, which position he resigned in 1919 to become director of publicity of the Southern Utilities Company. Mr. Carraway had served as chairman of the publicity committee of the Southern Gas Association and also as a member of the managing committee of its advertising section.

Trade and Market Conditions

Business Reviews, Together with Market Letters from Important Trade Centers, on the Supply, Demand and Prevailing Prices of Electrical Apparatus and Supplies

Keener Competition on Control Devices

COMPETITION is keen among manufacturers of electric controlling devices in an attempt to secure what business is on the market, according to an inquiry just made by the ELECTRICAL WORLD. Prices were reduced generally several months ago, and there is no expectation of another such decrease soon, but there is a tendency to go after business on a price basis, and it is reported that special prices have been made in special cases.

In spite of this competition, or owing perhaps to the hard work it engenders, one company records a greater volume of sales for a greater cash value this last month than was the case six months ago. Deliveries of the apparatus are approximately normal. Manufacturers are optimistic regarding the future, feeling as they do that they have successfully passed the worst period and will go steadily ahead from now on.

Good Foreign Demand for Farm-Light Plants

COMPACT and simply operated electric lighting sets for household, estate or club installation, according to *Commerce Reports*, find a good sale in such countries as India, Ceylon, Mexico, parts of Central and South America, Java, the Malay States, South Africa, East Africa, and to some extent Indo-China and China. Small electric lighting sets, as would be naturally expected, find their most ready markets where central station service is least developed and where there are large plantations and estates. At the present time the inactivity in such products as rubber, jute, tea, coffee and sugar has affected the buying power of the better fields for small lighting plants, but manufacturers will find it well worth while to arrange now for the necessary selling connections.

Switchboard Manufacturers Hold Their Own in Last Half Year

SALES of switchboards and panelboards during the last six months have held just about even, according to several prominent manufacturers. Conditions in the northern part of the country seem to have been slightly better than in the South, producers in the former section stating that sales have run somewhat ahead of those last September. In the South there has been a decrease in orders estimated at from 15 to 20 per cent. A manufacturer in the Middle West states that any increase in sales will be based on the belief of the public that prices are low, on the fact that many developments have been held up so long that further postponement is impossible, and on the small stocks very generally being carried.

There is a hint of brightness on the horizon, says this producer, for it seems impossible for construction to go forward this summer and not cause the sales curve of the switchboard industry to go up with it. Jobbers' stocks and those of dealers and contractors are about liquidated, so that when any demand does show up it cannot fail to improve the manufacturer's business at once. There is a fear on the part of some in the industry that dealers will let their stocks sink so low that the first indication of a business revival will bring a rush to buy and eventually a secondary condition of inflation.

Prices have been declining for the past year, and it is not evident yet that they have reached a stable level. However, there is some complaint that they have fallen too low and it would not be surprising to see a reaction upward whenever a sufficiently strong demand affords a reasonable excuse.

Heater Season Subnormal, but Ends with Small Carry-Over

SALES of air heaters during the past winter have been disappointing in most parts of the country, owing partly to general business conditions and partly to the mild winter which has prevailed in nearly all sections. Fortunately, however, jobbers and dealers were very cautious about building up stocks last fall, and the majority will go into the summer months with a negligible number of heaters left on their shelves. A general average of heater sales for the country as a whole, it is estimated, will run from 20 to 25 per cent under the previous season and from 40 to 50 per cent under the 1919-1920 season.

In the eastern part of the country sales were restricted considerably by the generally mild winter, and jobbers state that the volume for the season is about 3[illegible] per cent under last year. The prospect for the manufacturer next year is bright, nevertheless, for stocks have been whittled down almost to the vanishing point.

SALES IN NEW ENGLAND HELD UP

Jobbers in New England have another story to tell, for probably 10 to 15 per cent more heaters have been sold this season there than a year ago. Two seasons back may have witnessed 80 per cent of the current season's sales. Carry-overs now amount to little because of hand-to-mouth buying. Price considerations affect sales inconsiderably. Electric radiators are staple products, standing fifth in the list of most popular appliances merchandised by one of the largest dealers. Some dealers sold fewer heaters this season than last, but, by and large, the demand is increasing annually in response to vigorous sales efforts.

The Middle Western 1921 heater market, taken as a whole, was not quite so good as that of 1920. While some dealers and jobbers have sold as high as 30 per cent more heaters than in 1920, a general average for 1921 business has been 85 per cent of that done in 1920. The 1921 carry-over was fairly large, but this season nearly all dealers report that their carry-over was very small. With the advent of the cheaper grades of appliances, the public is looking for bargains on the regular standard lines, and this problem must be worked out. The mild winter season has also acted to reduce sales of air heaters.

MILD WINTER RESTRICTS SOUTHWESTERN SEASON

A mild winter restricted the sale of air heaters in the St. Louis territory in the season about to close. The demand was especially quiet until the middle of January, but the subsequent cold weather has increased sales, and it is estimated that the total movement for the season will be about half of that in the season of 1920-1921 and possibly one-fourth of that in 1919-1920. The weather is considered to have been the controlling factor in the demand this year, and it is felt that price considerations had very little effect. The carry-over from the 1919-1920 season was very small, because of the big business and the difficulty in getting shipments, but that from 1920-1921 was heavy because of the sudden decrease in buying generally. Jobbers and dealers alike bought only as needed this season, consequently the carry-over will be very low.

This season has been a very disappointing one from the standpoint of air-heater sales in the Southeast. Jobbers report that sales in 1921 were only 50 per cent of those

for 1920 and probably not over 33 per cent of those for 1919. Strenuous efforts to move stocks failed to bring results, even sharp price reductions being of little or no avail. As a result of this there is going to be quite a heavy carry-over by nearly all the jobbers in this section.

In the Intermountain region the carry-over is not so heavy this year as it was last, although total sales have been less. Jobbers and dealers did not stock so heavily during the past year, basing their judgment on the disappointing experience of the years 1919 and 1920. It is the general opinion that heater sales would have reached a much better volume in 1921 if the price schedule had been lower. Certain old-type heaters did not move well because of the arrival on the market of improved new types. Special price reductions are necessary to move them at all. Recent price reductions did not come soon enough to enable jobbers and dealers to clean up their stocks. The radiant-type heater in 600-watt to 1,000-watt sizes is in best demand in this territory. The fact that they can be connected to any socket gives them preference.

PACIFIC COAST SEASON SPOTTY

The past season in California was wonderfully assisted by an unusual spell of cold weather both for severity and duration. The result was that practically all surplus stocks on jobbers' and dealers' hands were sold during January and February and reorders actually placed at a time when the season is considered at an end. It is estimated that close to 20,000 radiators of all types and makes were sold in California during the past season, which is about 20 per cent over the sales of last year and very close to the sales of two seasons ago. A surplus of about 3,000 radiators was carried forward last year and almost as many the season before, but this year not more than a few hundred still remain. One manufacturer claims to be nearly six months ahead of his last year's showing. The reduced prices were expected by the public and cannot be said to have increased the sales to any appreciable extent. A noticeable California feature has been the sale of the large and stationary type to apartment houses. Many of the new apartment houses are being so equipped, and it is the local opinion that greater sales effort would have provided an even better showing. The experience gained this past year will be found very profitable next season.

Jobbers and dealers on the Northwest Pacific coast agree that the 1921-22 heater sales have been rather poor. The volume of business done was less than in 1920-21 and very much less than for 1919-20. While there are no exact figures available, it is safe to say that last season was 25 per cent under the 1920-21 season and from 50 to 60 per cent less than the 1919-20 season. The carry-over this season is universally small. The carry-over for 1920-21 with comparatively small orders was practically sufficient to handle the trade for the 1921-22 season. Business depression may have had a slight effect on sales, but the unusually long cold winter has had a counterbalancing effect. High prices decreased the demand for the better type of heaters and encouraged the cheap type handled by every class of store.

Prices Drop on Some Lines of Motors

SEVERAL large manufacturers of motors have announced decreases of from 5 to 14 and 15 per cent on alternating-current polyphase motors, the drop taking effect in the case of two manufacturers just before March 1. The reduction is on all sizes of the alternating-current polyphase motors, but does not apply to the single-phase or to the direct-current. One manufacturer gives the decrease as 10 per cent on induction motors, 7½ per cent on wound-ring motors under 10 hp. and 10 per cent on those above that figure.

The move was not generally expected and is taken as an indication of a desire on the part of manufacturers to get sales started if at all possible. Costs have been coming down steadily for the last year, but one producer of both large and small motors stated to a representative of the ELECTRICAL WORLD that this price cut added to those in 1921 anticipated still lower material and labor costs. There was very little profit in motor business today, he said, and not much business either. How much further prices of raw material can drop is a question, he continued, for the copper market is evidently at almost its lowest point and probably will react soon, electrical sheet is firm and the market for castings is steady. Another reason for the drop is ascribed by another manufacturer, who says that it is the first move in getting the "war-baby" and second-hand market cleaned out and new stock moving from the factory.

Whatever the reason, there is little increased demand yet as a result of the cut, and the quiet market of the last two months still continues. Here and there there is a sale to an industrial, but as a whole stocks are moving very slowly.

Strong German Competition in China

THE terms offered by German manufacturers of electrical goods are becoming a strong factor in China, according to Julean Arnold, commercial attaché at Peking. This is particularly true in the line of industrial machinery and plant equipment. Very recently the Siemens-Schuckert Electrical Company formed an alliance with Chinese interests for the development of a large electrical manufacturing plant at Saochan. The same company has arranged to erect a meter factory in Japan in conjunction with the Furukawa Electro-Industrial. In this connection the Department of Commerce advises that the investment of American capital and co-operation with Chinese financial interests are important means for taking fullest advantage of opportunities offered by the Chinese market.

Metal Market Situation

THE copper market seems to have reached another turning point at 12½ cents per pound, and there are signs that the firmer feeling noted at the beginning of the week will continue to increase. There has been somewhat of an improvement as far as buying orders are concerned, though no move has been made to start the price up again. Large producing companies seem determined to let quotations go no lower than 12½ cents, and the consumers have taken this as a sign that it would be wise to stock up on future deliveries at that price.

Offerings by second hands have been reduced in volume. Competition for brass and copper products developed lower prices during the last week end, and copper wire declined to 14 cents, rods to 13½ cents and other products in proportion. England, France and Germany purchased fair-sized tonnages of the red metal during the previous week, and there is more activity in the export market than has been noticed for several weeks. It is reported that during the dullest period the Copper Export Association sold as low as 12⅞ cents, c.i.f. European ports, but at present is actually booking orders at 13 cents and higher.

Part of this improvement in the market may be laid to the fact that the producers and large selling agencies are not competing so actively among themselves for the business. As long as sellers continued to force copper on the market at any price for the sake of an occasional sale consumers were frightened off and the market continued to sink lower.

NEW YORK METAL MARKET PRICES

	Feb. 28, 1922	March 7, 1922
Copper:	£ s. d.	£ s. d.
London, standard spot	58 15 0	60 2 6
	Cents per Pound	Cents per Pound
Prime Lake	13.00	13.00–13.25
Electrolytic	12.75	12.87½
Casting	12.50	12.62½
Wire, base	14.00–14.25	14.00
Lead, Am. S. & R. price	4.70	4.70
Antimony	4.25	4.20
Nickel, ingot	41.00	41.00
Sheet zinc, f.o.b. smelter	8.00	8.00
Zinc, spot	4.90	4.97½
Tin, straits	30.00	29.00
Aluminum, 98 to 99 per cent	19.10	19.10
OLD METALS		
Heavy copper and wire	10.50–11.25	11.00 –11.25
Brass, heavy	4.75– 5.00	5.00 – 5.25
Brass, light	4.25– 4.50	4.37½– 4 62
Lead, heavy	3.50– 3.75	3.75 – 3.87
Zinc, old scrap	2.00– 2.12½	2 25 – 2.50

THE WEEK
IN TRADE

Prices When Quoted Are Those Prevailing at the Opening of Business on Monday of This Week for Points West of the Mississippi River and on Tuesday for All Eastern Points

A SOMEWHAT dull and unsettled market prevailed all last week in the electrical supply field. Sales of even the "bread-and-butter" materials remained light and unsteady, but here and there there were compensations in the shape of sales of line material, central-station apparatus or other important items. Chicago jobbers have made good sales of poles, wire, cross-arms and other line materials to those central stations that lost lines in the Michigan and Wisconsin sleet storm. Central stations in the Southwest are buying more weatherproof wire, and railroads there are still heavy purchasers of dry cells. Sales of underground cable have picked up in Boston, and so also has street-railway buying. A washing-machine campaign is going ahead successfully in the Intermountain section, and there is a good agricultural demand for small motors. A heavy demand for schedule material is reported from San Francisco. Electrical permits in Portland for February show an increase of about 7 per cent over January.

Price changes reported during the week included a 5 per cent decrease on pole-line hardware and 10 to 15 per cent decrease in Atlanta, and a 10 to 20 per cent decrease on switches and plug cut-outs, a slight drop on weatherproof and a 30 per cent cut on porcelain in Portland.

NEW YORK

Activity in the electrical trade remains at virtually the same level as reported last week. Jobbers state that there is a steady flow of small and moderate-sized orders for wiring material from contractors. There is, however, no tendency on the part of the contractors and dealers to increase stocks, and hand-to-mouth buying is still pretty much the rule. Building activity continues to increase and is responsible for most of the demand for wiring supplies.

Motor manufacturers have announced additional discounts of from 5 to 15 per cent on polyphase motors. Otherwise there were no price changes reported. Close buying on wiring supplies is apparent, and some price competition is evident in a few quarters.

Jobbers are busy closing up contracts for fans and expect to make shipments during the latter part of this month. Generally, the dealers' and jobbers' stocks were fairly well cleaned up last year, and prospects for the coming season are very good. The demand for heating appliances is sluggish. Radio apparatus continues to be in as great demand as ever, with but little improvement in shipments from manufacturers.

Rigid Conduit.—Prices on rigid conduit remain unchanged, and jobbers report only a very moderate demand. Quotations this week were as follows: For ½-in. black pipe in 2,500-ft. lots, $44 to $45; ¾-in., $57 to $58, and 1-in., $82 to $83 per 1,000 ft. Galvanized pipe in the same sizes and quantities was quoted at $49 to $50, $64 to $66 and $91 to $93 per 1,000 ft.

Rubber-Covered Wire.—No change in conditions in the wire market was noted. No. 14 rubber-covered is quoted at $6.25 to $6.35 per 1,000 ft. in 5,000-ft. lots.

Flexible Armored Conductor.—The demand for this material remains fairly steady, with ample stocks in jobbers' hands. No. 14, two-wire, single-strip, is quoted at $43 to $45 per 1,000 ft., and double-strip is $45 to $47 per 1,000 ft. in that quantity.

Metal Molding.—With a very light demand the quotation for metal molding is still $5.60 per 100 ft.

Dry Cells.—A fair demand is reported with ample stocks on hand. In barrel lots of 125, igniters are quoted at $30 per 100.

Lamp Cord.—Some changes in price of lamp cord have been reported. No. 18, cotton twisted, is quoted at from $11.65 to $12.75 per 1,000 ft. in that quantity. No. 18, cotton, parallel, is quoted at $14.50 to $15.45 per 1,000 ft.

Washers.—A little more activity is seen in the demand for washing machines. Jobbers report that the smaller sizes are moving best.

Radio Equipment.—There has been no let-up in the demand for wireless apparatus, and deliveries are little, if any, better. One jobber reports receiving a small shipment of thirty "Tungar" rectifiers, while his orders on hand called for more than three times that number.

CHICAGO

Building permits issued in the city of Chicago for the month of February were 634, with a valuation of $13,493,000. This shows an increase in apartment-house building of 58 per cent over January. The permits for industrial construction increased from 82 in January to 116 in February, an increase of 42 per cent. This increase in activity during a dull month has been taken as a good sign for coming spring business by most dealers.

During the week plans were announced for building a 3,000-room hotel, to cost between $12,000,000 and $15,000,000. The building will be twenty-five stories in height. Construction plans are nearly finished, and work will begin as soon as uninterrupted construction is assured.

Activity in the electrical supply field has continued to be steady and fair, but with few large sales of any materials. Keen competition on conduit exists, and it is available in any amount at good prices. Poles are moving northward to replace fallen transmission lines in Wisconsin and Michigan. There is a shortage of radio vacuum tubes with deliveries averaging several weeks.

Wire.—With No. 14 rubber-covered wire selling between $6.25 and $6.40 per 1,000 ft. in 5,000-ft. lots, a fair demand has been reported by the majority of jobbers and dealers. The weatherproof and base wire market is also fair but with few large sales. Prices have not changed and stocks are ample.

Rigid Conduit.—Keen competition has lowered prices, and the ½-in. black pipe is available in 5,000-ft. lots at $40 to $42.50 per 1,000 ft. Stocks are in good condition.

Flexible Armored Conductor.—A moderate but steady business has been noted. The No. 14 two-wire, single-strip, is selling between $43 and $45 per 1,000 ft. in 5,000-ft. lots.

High-Tension Equipment.—A complete 66,000-volt 15,000-kva. outdoor substation was shipped to Scandinavia by one manufacturer during the week. This company also sold two 22,000-volt, 900-kva. substations to a firm in Pennsylvania. Another company is quoting on twenty-five 33,000-volt substations for a utility in southern Illinois.

Poles.—The storm damage to the transmission lines in Wisconsin and Michigan has aided the market for poles and pole-line equipment. Nearly all dealers tell of immediate shipments to these areas and state that their stocks are in good condition to supply this demand. No price changes have been noted and the 7-in., 30-ft. Northern white cedar sells for $8.40 f.o.b. Chicago.

Lamp Cord.—A spotty market exists, a few dealers reporting poor business, while others say that the silk cord is moving well. The No. 18 cotton parallel sells for $16 per 1,000 ft., and the silk parallel is quoted at $26 to $27 in lots of the same quantity.

Radio.—Popularity of this line is continuing, but stocks are in no better condition than they were a few weeks ago. All dealers have orders booked ahead and deliveries are in most cases two or three weeks. Crystal detectors are available, but very few vacuum tubes are on dealers' shelves. Stocks of head phones are not large, but are being improved daily.

Heating Appliances.—Activity on ironers, toasters and

open-air heaters has been moderate. No pronounced demand for any one line has been noticed, and dealers report their stocks in fair condition.

Washers and Cleaners.—The majority of dealers report that sales on washing machines for the last two months have been good. Stocks are ample. Vacuum cleaners have sold fairly well, but not so steadily as the washers. Stocks are in fair condition.

BOSTON

Business is spotty in New England this week, but in the electrical field the tone is better than in February. The textile strike is hampering general business somewhat, but electrical jobbers and manufacturers have not been affected seriously as yet by curtailment of the small replacement business being handled of late. Moderate improvement is evident in the metal-working field and in the building industry. Prices are a little uneven, rubber-covered wire showing weakness under close competition. No shortages of supplies are apparent. A 20,000-kw. turbine was ordered last week for a new electric railway generating plant to be built at Providence, R. I., and some central-station buying of underground cable was also put through. Retail trade is improving over February figures.

Motors.—"Pick-up" business dominates the market, but inquiries are showing considerable activity. Stocks are ample for current requirements.

Wire.—Moderate sales are reported. Rubber-covered wire prices are uneasy, No. 14 selling from $6 to $5.50 or lower, according to competition, in 5,000-ft. lots. Weatherproof wire is moving slowly around 15½ cents base, and small sales of bare copper are reported at 14½ cents to 14¾ cents for No. 00, in 5,000-ft. lots. Some street-railway replacement work is under way, though of small volume.

Porcelain.—Light sales are being carried through, with good supplies for current needs. "Nail-it" knobs are selling around $15.50 per 1,000 in barrel lots, ⅞-in. by 3-in. tubes at $4.50, and 6-in. tubes at $9.

Vacuum Cleaners.—A dull market is evident, with light sales in response to vigorous canvassing. Prices are firm.

Washers.—A better tone in washers is evident, sales having picked up somewhat last week in retail circles. Price variations are still proving troublesome to distributers. Stocks are plentiful.

Loom.—Fair sales are reported on some days and light orders on others. Building operations tend to absorb more of this material than in the past few weeks.

Lamps.—A slight recession in lamp demand is apparent, following unusually active post-holiday sales, which were protracted far into the winter. Portables are still moving freely in retail circles under sharp competition.

Meters.—A better movement is expected to develop shortly as building operations increase.

ATLANTA

General business conditions in this section might be characterized as spotty with an air of dullness throughout the entire line. This is a somewhat natural condition for the latter part of February, and, all things considered, it might be safely stated that conditions have a brighter aspect with a slow but irregular improvement to be noted. Unfortunately, there has been some increase in non-employment during the month of February, New Orleans showing an increase of 2.3 per cent and Atlanta a fraction over 1 per cent. but this is offset by decreases in Chattanooga and Birmingham, most of the decreases being shown in the railroad repair shops, building-material lines and iron and steel products. This is probably due largely to very unfavorable weather conditions, which have held up all outdoor construction work, but with the advent of spring employment conditions should materially improve, especially in the building-trade line.

February building permits in Atlanta are the heaviest on record, residential permits alone totaling 390, with the valuation of all permits at $1,045,000. This compares well with February, 1921, when the permits were valued at $533,000. An indication of the general improvement is to be noted in the Sixth Federal Reserve Bank report, which shows a reserve ratio of 69.2 per cent as against 42.1 per cent a year ago, while local clearings show an increase of approximately $1,000,000 per day.

Portable Lamps.—Little activity has been reported either in the mahogany stand and silk shade or the metal type since the holidays, and some price cutting is to be noted. Local stocks are reported good to heavy.

Industrial Motors.—Sales of the popular sizes, while not up to anticipations, are showing a slight improvement, particularly in sizes of 50 hp. and under in 220 volts. The larger sizes, except in isolated instances, are reported very sluggish. Stocks have been allowed to shrink somewhat, but are still equal to the demand.

X-Ray Outfits.—Extreme activity is to be noted, there being a largely increased demand for the more reliable and expensive types, with the smaller sets continuing quite popular. Local stocks have become very spotty, with deliveries on the former type of equipment as long as ninety days.

Oil Switches.—Little movement of this item is reported, as most industrials are at present holding off on installation of equipment requiring this control apparatus. Stocks as a whole are somewhat low.

Pole-Line Hardware.—A drop in price of 5 per cent became effective on Feb. 22. Spring activity is not to be noted as yet, but local stocks are being put into good shape in the anticipation of activity in the near future.

Schedule Material.—Weather conditions holding up construction work are reflected in the movement of schedule material, which is quite slow throughout. Local stocks are in good shape, and price reductions of from 10 per cent to 15 per cent are reported as effective last week.

Electric Elevator Equipment.—A steady demand is reported for the smaller commercial types, with an encouraging number of inquiries for the high-speed office-building equipment being received. Shipments of the smaller types are from stock, with the larger and higher-speed equipment on approximately a ninety-day basis.

ST. LOUIS

Building permits issued in St. Louis during February for new work, additions and alterations amounted to $1,285,735, as compared with $1,119,530 in January and with $714,845 in February of last year. Of this amount new factories comprised but $20,500 for three structures, the majority of the permits being for residential building. The volume of the latter form of work is being steadily maintained, and an active real-estate market indicates there will be quite a bit of such work this spring. In furtherance of construction some of the trades have agreed upon reduced wage scales, and the indications are more promising that the other trades will be falling in line.

The residential construction work results in a fairly steady demand for the "bread-and-butter" materials, but jobbers report that buying to any great exent by the industrials has not yet materialized. A few large orders for power-plant equipment are being placed, the state university being one of the buyers last week. In the last monthly report of the Eighth District of the Federal Reserve Bank it is said that buyers are in a hesitating mood and the movement of general commodities is disappointing despite the stable prices, the rise in important farm products and the strong financial position of the nation. While the grain-producing districts were assisted by a sharp rise in the price of corn, wheat and oats, many of the producers had already marketed their stocks. Reports from the manufacturers were discouraging, the report said. Cheap and medium-priced goods were called for. Railroads reported an improvement in the volume of freight traffic.

Dry Cells.—Demand has been steady and exceptionally good for several months. The railroads continue to buy in liberal amounts. Stocks are usually in good shape but at times run low. The igniter is priced at 32 cents and the regular at 31 cents, both for barrel lots.

Storage Batteries.—The increased use of wirelcss outfits is creating an additional field for jobbers handling storage batteries, and sales have been very good. The demand for

automobile purposes has also been active. Stocks are in excellent condition.

Wire.—Movement continues on about the same basis, No. 14 rubber-covered being the only class to sell in large quantities. Central stations are buying weatherproof to a slightly greater degree, and there have been a few good sales of bare wire for high-voltage line work. Typical quotations are: No. 14 rubber-covered, $6.25 per 1,000 ft. in 10,000-ft. lots; base on weatherproof, 16 cents per pound; base on bare, 16 cents per pound.

Pliers.—All linemen's tools are selling very slowly, and the stocks are well up. The 6-in. side-cutting Klein plier is priced at $2.80 and the same in the 8-in. size at $3.75.

Poles and Cross-Arms.—Though there is a good deal of line work under contemplation, actual sales continue to be slow. In St. Louis and the immediately surrounding territory a fairly large amount of extension work will be started shortly. Northern white cedar poles, with 7-in. tops, in carload lots f.o.b. St. Louis, are quoted as follows: 30-ft., $8.90; 35-ft., $14.60; 40-ft., $18.65; 45-ft., $21.75. Fir arms, 3¼-in. by 4¼-in., are priced per 100, f.o.b. St. Louis, as follows: 3-ft., $51.38; 4-ft., $68,31; 6-ft., $102.77; 8-ft., $137.03; 10-ft., $152.25. Excellent deliveries of both poles and cross-arms can be given.

SALT LAKE CITY—DENVER

Weather conditions were unfavorable to business during the past week, the Intermountain sections being caught in the great storm wave that swept the country. Milder weather prevails now, and merchants are confidently looking forward to the opening of spring. It is expected that building will then begin and mark the opening of an era of better business generally. Electrical contractor-dealers are making preparations for handling a good volume of work, stocking to a degree that has not been known in the past year. Jobbers are well prepared to handle all orders for materials, but little call is being made on manufacturers to furnish new stocks. Until construction gets well under way it will not be necessary for jobbing houses to replenish their stocks. One of the most encouraging signs since the slump in metal prices a year ago is the announcement by the International Smelting Company that it will resume operations within sixty or ninety days. The time from now to the date of blowing in the furnaces will be used to build up stock piles as storage against emergency. Besides being a highly significant event to the mining industry, the immediate effect will be the re-employment of 300 to 400 men. The outlook for the copper industry is still unsettled, production on a partial scale going on in several centers.

Washing Machines.—The big spring drive on washers has been launched, and during the month hundreds of contracts with home owners will be closed. Terms are usually easy, as little as $1 down being required with $5 a month on the balance. The low price of copper is making the copper tub practicable from the point of view of price. Several important improvements in models are being demonstrated.

Motors.—Pending irrigation projects are stimulating interest in large-size motors for pumping. Small-size motors are also in fair demand by farmers and orchardists who are planning private installations.

PORTLAND—SEATTLE

Business continues reasonably good, although it appears to be materially influenced by weather conditions. Long-continued bad weather has held back the starting of many projects, and immediate prospects for a pick-up have been postponed somewhat on this account. The February volume probably will not show a very bad total, even though it may not quite reach previous expectations.

Building is increasing throughout the Northwest. Building permits for Portland for February, 1922, exceeded those for February, 1921, by 5 per cent in number, and those for January, 1922, by about 7 per cent, with a corresponding increase in valuation. The value of building permits for February in Seattle was $611,635, or about $33,000 more than for February, 1921. Seattle's water-borne commerce for January, 1922, showed an increase of nearly 52 per cent over January, 1921. Electrical permits in Portland for February, 1922, showed an increase of about 7 per cent over January, 1922. Lumber production for the week ended Feb. 25 was only 12 per cent below normal.

Electrical business, while only moderately good, shows some improvement over the preceding week. Sales are highly diversified and orders are largely for small lots. Several price changes are reported for the past week. Switches and plug cut-outs show a drop of 10 to 20 per cent.

Rigid Conduit.—Quotations are now: ½-in., black, $6.25, and galvanized, $6.80 per 100 ft. in less than car-load quantities; ¾-in., black, $8.05, and galvanized, $8.85 per 100 ft.

Wire.—Weatherproof wire, triple-braid, sizes No. 4/0 to No. 6, also shows a slight drop. It is now quoted at $20.75 per 100 lb. No. 14 is now quoted at $7.55 per 1,000 ft. in coil lots and $6.70 per 1,000 ft. in 5,000-ft. quantities.

Porcelain.—Porcelain shows a very appreciable drop, ⅝-in. x 3-in. tubes being now quoted at $5.85 per 1,000 in unit-package quantities of 500. These were formerly $9.05 per 1,000. "Nail-it" knobs are now quoted at $23.75 per 1,000 in unit-package quantites of 500, and No. 5½ solid knobs are now quoted at $11 in similar lots. These were formerly $21 per 1,000.

Switches.—Tumble safety-entry switches dropped about 7 per cent on March 1. Motor-starting switches in small sizes also show a drop of about 30 per cent. Schedule adjustments have been made on sockets of all kinds so that dealers may buy assorted orders of 500 at discounts formerly applying on 1,000-unit quotations. This amounts to a drop in socket prices.

SAN FRANCISCO

Although there was a decrease in the value of February building permits as compared with last February that was slight in Los Angeles and more appreciable in San Francisco, yet construction continued at a high level because February, 1921, was a high month. The figures for February, 1922, are as follows: Los Angeles, $3,131,670; San Francisco, $2,830,991; Oakland, $1,424,772; San Diego, $490,357. The corresponding figures for February, 1921, were: Los Angeles, $3,254,131; San Francisco, $3,126,581; Oakland, $966,203; San Diego, $900,075.

Counter business is poor, but as crop prices are increasing and the season promises excellent crops there should be a return to normal conditions in appliances about the middle of the year. Export business has been signalized by several spectacular failures, but export conditions themselves are improving and the increasing value of foreign currency will help to stabilize the field. There is much non-employment of unskilled labor and many of the department stores have released scores of employees, but the trades unions are all busy. Relations with labor are in a healthy state.

Rubber-Covered Wire.—New price of No. 14, single-braid, solid, in 5,000-ft. lots is $6.75 per 1,000 ft. This is about the market. Stocks are good and the demand for all sizes and styles is steady.

Rigid Conduit.—The ½-in. black conduit in less than car-load lots is quoted at about $5.60 per 100 ft., while galvanized and sherardized sells at $6.10 per 100 ft. The demand is good. Local stocks have been good. Freight shipments have been arriving in quick time from the East, averaging about three weeks, and this service has been maintained all during the winter, aided by the relatively small amount of goods in transit.

Schedule Material.—Just at present sockets, switches and cut-outs of all kinds are showing the best movements of all electrical materials. This condition is general along the coast, but particularly marked in southern California. There have even been shortages of such essentials as ½-in. cap brass key sockets, push switches and fuse plugs, but such shortages have not continued more than a few days. Fuse plugs have been showing an especially good movement.

Manufacturers' Activities

Devoted to the Business Side of Manufacturing, Distribution and Sales, News from Jobbers and Foreign Fields and a Record of New Devices and Trade Literature

Hurley Buys Superior Machine Company

The Superior Machine Company, De Kalb, Ill., owner of the Cooling swinging wringer patents and manufacturer of the "Superior" oscillating-type and dolly-type washing machines, has recently been purchased by the Hurley Machine Company, Chicago. The Superior company will continue to manufacture and merchandise its products as formerly.

New Electrical Factory for Portland

The Wonder Electric Manufacturing Company has established a plant at Twenty-fourth and York Streets, Portland, Ore., which is fully equipped with machinery suitable for turning out electrical appliances of all kinds. The officers and stockholders of the company are all Portland men. The company is already turning out a commercial and a domestic type of waffle iron. Offices are maintained in the Chamber of Commerce Building. John W. Henry is president of the company.

Lamp Manufacturer Announces Change of Name

The plant formerly operated by Alfred Hofman, 150-52 Hudson Avenue, Union, N. J., has been taken over by Alfred Hofman & Company, the change extending to the company name only. The manufacturing and distributing policies and the general management of the business will remain the same. Alfred Hofman is president, Victor Anderson is vice-president, and Fritz Seifart is secretary and treasurer. The company manufactures electric lamp and other special machinery. Business in this line is slightly slower at the present moment than two years ago, according to Mr. Seifart, but there is enough activity to keep the plant working, owing to the demand for machinery for making tipless lamp bulbs.

Air-Way Cleaners Shipped to Far East and Europe

Shipments of the vacuum cleaners manufactured by the Air-Way Electric Appliance Corporation, Toledo, Ohio, have been made recently to Japan, Italy and Switzerland, according to C. A. Ward, sales promotion manager, and within the near future several shipments of both the standard and "Junior" cleaners made by the company are expected to go to Australia, Ecuador and several other foreign countries. In addition to this, Mr. Ward stated, the company has considerably widened the zone of its domestic distribution and has taken on a considerable number of new dealers.

Current sales of cleaners for several months past have shown an increase, Mr. Ward stated, due mainly to improved conditions generally and to good dealer co-operation. The outlook for the coming months, he said, is brighter than might have been expected before the beginning of the year as both old and new dealers are being welded into a more compact and effective selling organization than ever before and the realization is growing that the demand curve in the appliance industry will rise in direct ratio to the amount of sales energy expended.

Must Lower Production and Sales Cost, Says Trumbull

With about a 10 per cent reduction in wage scale, by improved methods and through increased earnestness in the staff of employees, the Trumbull Electric Manufacturing Company, Plainville, Conn., is making a greater profit today on a switch selling for $1 than was formerly reaped at a price of $1.40, says the company's house organ, the *Trumbull Cheer*, in the current issue. Lower retail prices must accompany the efforts of manufacturers to reduce costs, the company points out.

"Many elecrical retailers have 'come to,'" says the article, "but statistics clearly show that the last to leave the sinking ship of high prices is the retailer, and we have no reason to believe that *all* electrical retailers are exceptions to the rule." The claim is advanced that, on the whole, electrical manufacturers have done the trade a great service by seeing the need early in 1921 and by taking great losses in high-priced stock and overheads voluntarily. Those who do not improve in manufacturing and reselling processes, the article declares, will be hard pressed by those who do.

Radio Corporation Distribution Policy

Atlantic Division Jobbers Told Wireless Apparatus Will Be Marketed Principally Through Established Electrical Supply Houses

Considerable interest was aroused at the recent meeting of the Atlantic Division of the Electrical Supply Jobbers' Association, held Feb. 28 in New York, by the discussion of radio sales and manufacturing conditions by David Sarnoff, general manager of the Radio Corporation of America. The meeting lasted only one day, and Mr. Sarnoff's talk and the discussion following it occupied the entire afternoon session. The morning was given over to matters concerning salesmanship.

"The situation in the manufacture of sets and parts is such that manufacturers cannot possibly produce more than enough to furnish each distributer with a small portion of his demands," said Mr. Sarnoff, after explaining how the Radio Corporation had been formed and had become sole selling agent for the radio apparatus manufactured by the General Electric Company and the Westinghouse Electric & Manufacturing Company. "The General Electric and Westinghouse factories are going at top speed turning out the radio devices ordered by the Radio Corporation, running into many millions of dollars, and normal production is expected to commence in April of this year. It is hoped that during March there will be produced 75,000 vacuum tubes, and that beginning in April the production will be brought up to 100,000 tubes monthly. It is expected that within the next three to six months factory production can be built up to meet all reasonable demands. In the meantime the Radio Corporation will undertake to allocate fairly to each distributer an equitable portion of his orders.

"It is the opinion of those who have had opportunity to gain an insight into this business that it may easily develop in volume into something as great as or even greater than the phonograph industry, which is credited with an annual business of $400,000,000. The opening of broadcasting stations, from which popular programs are daily sent out, has unexpectedly created an opportunity for the merchandising of radio-telephone sets. The Radio Corporation realizes both the great possibility of failure, if improperly handled, and that for success, if properly handled, and feels morally responsible to guide every one who undertakes to sell its product.

"No jobber or distributer should undertake to handle this line unless he has technical knowledge of the subject or can get some one who has. The corporation is willing to consider the advisability of offering a course of instruction which would fit salesmen to handle this particular line of material—possibly in conjunction with the school which it now operates for the training of radio operators. For the present, however, it will be necessary to make use of the services of radio amateurs qualified to assist in the organization of special radio departments. The distributer or dealer who undertakes to handle this line must be equipped to render service. In the natural distribution of the apparatus it will be the dealer who will be called upon for this service, but it will be necessary for the

jobber and distributer to see that the dealer is equipped to furnish service on the apparatus, and that he does it.

"The Radio Corporation intends to market principally through established electrical supply jobbers. It will endeavor to encourage the purchase of its product by dealers through the jobber. It plans to appoint as jobbers those electrical supply jobbers throughout the United States who are prepared to function properly and do a real distributing job. At the present time the Radio Corporation has about seventy-five jobbers. Within a short time it will have 150. It is expected that some of these may not perform the services which will be expected by the Radio Corporation, and as a result the number of jobbers will probably be reduced to somewhere between seventy-five and a hundred. It is the policy of the Radio Corporation to grant an exclusive agency or exclusive territory to no one. It is kindly disposed toward the phonograph people and is studying their system of distribution."

As to the future plans for the establishment of broadcasting stations, Mr. Sarnoff stated that these plans will be subject to conferences now being held with the authorities in Washington. It is the intention to erect a sending station in the heart of New York City; also one each at Washington, San Francisco and Boston, and eventually, if proper conditions can be worked out and the business warrants, to cover the United States with broadcasting stations suitably located.

Buffalo Company Established to Represent Manufacturers

The J. Leo Scanlon Company has been established at 950 Ellicott Square, Buffalo, N. Y., to act as district sales representative for a number of well-known manufacturers in the electrical field. The company is headed by J. Leo Scanlon, formerly general sales manager for the Moloney Electric Company, St. Louis. The manufacturers represented include the Moloney Electric Company, Page & Hill Company, Schweitzer & Conrad, Inc., and the Ideal Electric & Manufacturing Company.

Philadelphia Jobber Reports Better Sales

Business is rapidly improving, according to George H. Carnall, sales manager of the Frank H. Stewart Company, 37-39 North Seventh Street, Philadelphia, electrical supply jobber. The past few months have shown an improvement in electrical activities, he recently declared to a representative of the ELECTRICAL WORLD, and it can be safely expected that March and April will be much better. At present the company is selling much seasonable merchandise for the coming summer and winter months. Much material that would ordinarily be sold later in the year is being pushed now. This method, he stated, has brought an increase in business by adding future sales to present.

Western Electric Sees 1922 Business Same as 1921

The outlook for business in 1922, according to a statement issued by Charles G. Dubois, president Western Electric Company, is that its volume will be substantially the same as in 1921. Sales of the Western Electric Company for 1921, he stated, had been eclipsed only by those of 1920 in all the time the company had been in business.

The statement was as follows: "The sales of the Western Electric Company for 1921 were approximately $185,000,000, which is a greater amount than in any previous year except 1920, when they were $206,000,000. The books have not yet been closed for the year, but it is estimated that some margin was earned above the regular dividends of $10 per share on the common stock. The company's floating debt was reduced during the year by $14,000,000 and its cash on hand increased by over $5,000,000, a total improvement of more than $19,000,000 in its financial position. The outlook for 1922 is that the volume of business will be substantially the same as in 1921."

In the annual report of the American Telephone & Telegraph Company, which holds a controlling interest in the Western Electric Company, the sales of the subsidiary company are given as $189,800,000, of which $135,600,000 were to the Bell companies and $54,200,000 to other customers. This was an increase over the previous year of 19 per cent to the Bell companies and a decrease of 41 per cent to other customers, indicating the activity of the telephone companies and the severe depression that characterized the electrical jobbing business during 1921. Unfilled orders of the Western Electric Company on Dec. 31, 1921, were given as approximately $76,000,000, as compared with $83,000,000 on the previous Dec. 31.

Incandescent Supply Opens St. Louis Branch

The Incandescent Supply Company of New York, with branch houses in Pittsburgh, Chicago and San Francisco, has established a new jobbing house at 1,118 Olive Street, St. Louis. A very general line of lighting fixtures, glassware, lamps, appliances and other electrical supplies will be carried. This branch is intended to cover the Southwest territory. Horace F. Kite will be the local manager.

Mueller Electric Plans New Building

A new factory, the first contracts for which were recently let, is planned by the Mueller Electric Company, 2135-43 Fairmount Road, Cleveland, manufacturer of storage-battery accessories. The new building, which is to be two stories in height will be erected on East Thirty-first Street between Payne and Superior Avenues and will be of the most modern construction. The new move brings the company closer to the business section of the town and assures better freight and express service to customers. The building will afford the company about 10,000 sq.ft. of floor space for manufacturing purposes.

According to R. S. Mueller, one of the officials of the company, current sales are holding up very satisfactorily. The year 1921, he said, was the second best year in the history of the business, having been exceeded in volume only by the extraordinary period of 1920. Sales of test and battery clips are back to normal, although sales of attachment plugs have continued rather quiet.

The American Wiremold Company, Hartford, Conn., manufacturer of apparatus for bending wire work, recently secured a three years' lease on offices at No. 252 Asylum Street, that city.

Cote Brothers Manufacturing Company, 1425 First National Bank Building, Chicago, manufacturer of refillable fuses, has announced the establishment of branch offices in New York, Philadelphia, Boston, Cleveland, Tampa Denver and San Francisco.

The George J. Hagan Company, Pittsburgh, furnace and combustion engineers, has recently established offices in Detroit and Chicago. The Detroit office is at 515 Murphy Building and is under the management of J. Sandberg, formerly with the General Electric Company. The Chicago office is at 20 East Jackson Boulevard and is under the management of V. A. Hain, formerly with General Electric Company.

The Acme Electric & Manufacturing Company, 1,444 Hamilton Avenue, Cleveland, announces the appointment of new sales representatives for the "Acme" motor-generator equipment as follows: The E. & M. Products Company, 50 State Street, Boston; Wilson, Ensign & O'Hara, Real Estate Trust Building, Philadelphia; Corte Engineering Company, 3414 Woolworth Building, New York City; E. L. Bailey, Ford Building, Detroit, and the McDowell Machinery Company, 343 South Dearborn Street, Chicago.

The John Hugo Manufacturing Company, New Haven, Conn., manufacturer of electrical specialties, has filed a certificate with the Secretary of State of Connecticut to increase the capital stock from $50,000 to $150,000.

The Chicago Bridge & Iron Works, 30 Church Street, New York, has received a contract from the Brooklyn Edison Company for furnishing and erecting two steel stacks, 15 in. in diameter and 250 ft. high, for the new power plant of the Edison company at the foot of Sixth-sixth Street, Brooklyn.

I. P. Frink, Inc., New York, has appointed R. M. Booth as representative in southwestern Ohio, southeastern Indiana, eastern Kentucky and western West Virginia, with headquarters at 17 Greenwood Building, Cincinnati. Mr. Booth was formerly with Johns-Manville, Inc., which up to this time has had the agency in that territory for Frink products.

Foreign Trade Notes

PROPOSAL TO FORM A COMPANY TO MARKET ELECTRICAL EQUIPMENT IN ITALY.—A proposition to organize an Italian company which would handle the marketing of American electrical equipment in Italy has been submitted to Assistant Commercial Attaché Osborne by an electrical expert in Rome for submission to American manufacturers. It is his idea that specialties such as washing machines, heaters, etc., would sell better in Italy at the present time than heavy electrical machinery, and the proposed company would give its attention to small equipment and appliances. A translation of the proposal as submitted, together with the address of the Italian expert, may be obtained from the Electrical Equipment Division of the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, by referring to exhibit No. 1348.

FREE IMPORTATION OF MATERIAL FOR THE BRAZILIAN CENTENNIAL EXPOSITION.—The essential provisions of the special Brazilian revenue law to facilitate the entry into Brazil of material to be used in connection with the National Centennial Exposition, according to *Commerce Reports*, are as follows: Exemption from customs duties and internal revenue taxes is accorded to articles to be exhibited as well as to all materials to be used for the pavilions; at the close of the exhibition all articles not re-exported within the period fixed by the directing committee of the exposition will be subject to the payment of duties recorded by the customs officials upon the entry of these articles; exemption from customs duties is granted to articles presented to public institutions, or which as advertisements merely are distributed gratuitously to visitors, and to construction materials for pavilions acquired by the government; consular invoices accompanying articles for use in the exposition will be free of charges. All volumes must be marked "Exposicao Brasileira," with another mark indicating the importer or the recipient in Rio Janeiro.

PROPOSED INDUSTRIAL PLANTS.—Plans are being formed by C. C. Nieh, Lu Er-kia and other Shanghai merchants, *Electrical Industries* states, to organize the Yeh Chung Machine Manufacturing & Engineering Company in Shanghai. The company is capitalized at $300,000 and will manufacture electric fans, electric lamps, generators, motors, etc. The Ta Tung Company, Ltd., has recently been organized by Chang Chien, Jr., and others with a capital stock of $1,000,000 at Garden Row, Tungchow, and will specialize in engineering and electricity.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

Manufacturers' agent in Canada (No. 970) desires to secure an agency for the sale of tools for electricians, small machinery and equipment, electrical fittings and attachments, etc.

An engineer in the Azores (No. 974) desires to be placed in communication with exporters of electrical apparatus.

A mercantile firm in Norway desires to secure an agency for the sale of electrical supplies, insulating materials of all kinds, backing joints and gaskets, armatures, etc.

New Apparatus and Publications

STOVE.—The Acme Electric & Manufacturing Company, 1448 Hamilton Avenue, Cleveland, has recently placed on the market the "Acme" electric utility stove.

PLUG.—The Bryant Electric Company, Bridgeport, Conn., has developed a new appliance switch plug, known as Bryant No. 651, which it will soon place on the market.

LIGHTNING ARRESTERS.—The Electric Service Supplies Company, Philadelphia, has issued bulletin No. 183, describing the "Keystone" expulsion type and the "Garton-Daniels" lightning arresters for central-station, line, transformer, railway and mine protection.

WIRE.—The Electrical Alloy Company, Morristown, N. J., is distributing two leaflets, one describing its "Calido" resistance wire for pressing irons, toasters and cord-attached electrical devices, and the other calling attention to its various types of electrical wires and alloys.

METER SWITCHES.—Circular No. 4484, recently issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, describes the Westinghouse meter-service switches.

WATER HEATER.—The Automatic Electric Heater Company, Warren, Pa., announces a new 1,000-watt "Sepco" automatic-circulation-type water heater as the final number in its complete line.

LIGHTING PLANT.—Day & Zimmermann, Inc., 611 Chestnut Street, Philadelphia, engineers, are distributing a booklet, entitled "The Front Street Plant of the Erie Lighting Company," in which it describes and illustrates the results and actual performance of this station, which was designed by and built under the supervision of the company.

WAGON LOADER.—The George Haiss Manufacturing Company, 141st Street and Rider Avenue, New York City, manufacturer of hoisting machinery and clamshell buckets, is distributing booklet 521, describing its new "Hais" creeper, "Path Digging" loader, coal-handling machinery, elevators, conveyors, screens, gates, buckets, etc.

OIL CIRCUIT BREAKERS.—The Condit Electrical Manufacturing Company, 60 High Street, Boston 9, has brought out a new oil circuit breaker, known as type D-22, designed to open circuits of high amperage.

IRONER.—An open-end electric ironer ("Horton") has been placed on the market by the Horton Manufacturing Company, Fort Wayne, Ind.

FIRELESS COOKER.—An automatic electric fireless cooker has been placed on the market by the William Campbell Company, Detroit.

CLOTHES DRYER.—An electrically-heated cabinet for drying clothes indoors is manufactured by the Scientific Heater Company, Cleveland.

TUNING UNIT.—The Ship Owners' Radio Service, Inc., 80 Washington Street, New York City, has placed on the market a new tuning unit, known as "Tunit."

EXTENSION DISTRIBUTER.—A new four-way extension distributer has been developed by the Diamond Electric Specialties Corporation, 101 South Orange Avenue, Newark, N. J.

FIRELESS COOKER.—The Cook Electric Heating Company, 717 Frankfort Avenue, Cleveland, has developed an electric fireless cooker.

WATER HEATER.—The Warnerlite Company, 745-769 South Raymond Avenue, Pasadena, Cal., has placed on the market an electric water heater.

FAN.—The Bayley Manufacturing Company, Milwaukee, is marketing a new variable-speed disk fan.

GLUE POT.—The Charles E. Francis Company, Rushville, Ind., has placed on the market a portable electric glue pot.

New Incorporations

THE CYR ELECTRIC COMPANY, Van Buren, Me., has been organized with a capital stock of $10,000 to generate and distribute electricity for lamps and motors in the plantation of Cyr. The officers are Elzear Lapointe, president; Napoleon Lapierre, treasurer, and Nell J. Lapierre, clerk, all of Cyr Plantation.

THE MORRIS (IND.) LIGHT & POWER COMPANY has been incorporated by Aleys Bischoff, Anthony Haskamp and John Nordmeyer. The company is capitalized at $10,000 and proposes to supply electricity for lamps and motors.

THE FREEDOM TOWNSHIP ELECTRIC COMPANY, Claysburg, Pa., has been incorporated by Fred S. Dunlap and F. L. Greene, both of Claysburg, and Thomas N. Kurtz, Hollidaysburg. The company is capitalized at $5,000 and proposes to furnish electricity for lamps, motors and heaters.

THE MUTUAL ELECTRIC LIGHTING COMPANY, Greenfield, Ind., has been incorporated with a capital stock of $2,625. The directors are Claude White, Lawrence E. Streng, Peri C. Devore, Carl Weber and Ernest W. Jacobi.

THE KEYSTONE POWER COMPANY, Ridgway, Pa., has been granted a charter, with a capital stock of $1,250,000, to take over a number of electric companies operating in Elk and adjoining counties. The incorporators are Carl F. W. Kealer, Rochester, N. Y.; H. S. Clader, Philadelphia, and N. M. Seabrease, Chestnut Hill.

Record of Electrical Patents

Notes on United States Patents

(Issued Feb. 14, 1922)

1,406,576. THERMOELECTRIC TRANSFORMER: Howard J. Murray, Brooklyn, N. Y. App. filed April 11, 1918. Electric generator in which heat is applied or withdrawn from its field, producing an electric current.

1,406,624. METHOD OF AND APPARATUS FOR EXTRACTING BROMINE; Herbert H. Dow, Midland, Mich. App. filed June 7, 1916. Electrolytic cell for liberating chlorine and bromine.

1,406,645. INCANDESCENT ELECTRIC LAMP: John A. Heany, New York, N. Y. App. filed July 29, 1916. Short large-diameter filament element.

1,406,668. TELEPHONE-EXCHANGE SYSTEM: James L. McQuarrie, New York, N. Y. App. filed Aug. 7, 1919. Pertains to step-by-step numerical selector switch.

1,406,672. VIBRATION DETECTOR: Joseph P. Maxfield, Millburn, N. J. App. filed June 24, 1919. For detecting vibrations propagated through water.

1,406,674. TARGET APPARATUS: Arnold Michoud, Yverdon, Switzerland. App. filed June 10, 1919. Automatically operated indicator locating hits near marksman.

1,406,678. TELEPHONE SYSTEM: Louis A. Mortimer, New York, N. Y. App. filed March 2, 1920. Machine switching.

1,406,681. PROTECTIVE DEVICE: Robert E. Ottman, East Orange, N. J. App. filed Oct. 29, 1920. Protector blocks used in open space cut-outs.

1,406,696. SELF-COOLING STRAIN INSULATOR; Louis Steinberger, Brooklyn, N. Y. App. filed Oct. 12, 1918.

1,406,697. SELF-COOLING STRAIN INSULATOR; Louis Steinberger, Brooklyn, N. Y. App. filed Dec. 10, 1918. Means for flashing over during abnormal conditions.

1,406,698. STRAIN INSULATOR; Louis Steinberger, Brooklyn, N. Y. App. filed Dec. 10, 1918. Means for flashing over during abnormal conditions.

1,406,726. MEANS FOR ADDRESSING AN AUDIENCE; William Dobson, Rockford, Ill. App. filed Oct. 7, 1919. Assistant telephones address to speaker, who repeats it.

1,406,731. SYSTEM OF ELECTRIC CIRCUIT CONTROL; James B. Heard, San Antonio, Tex. App. filed Aug. 16, 1918. For small power-plant operation.

1,406,738. MEDICAL APPLIANCE; Charles B. Hughes, New Orleans, La. App. filed April 2, 1921. Curative device without using induction coil.

1,406,741. ELECTRODE HOLDER; Robert M. Keeney and Philip J. Lonergan, Jr., Denver, Co. App. filed Jan. 20, 1920. For electric smelting furnaces.

1,406,760. ELECTRICALLY HEATED PRESSER FOOT; Hettie E. Rudolph, Bisbee, Ariz. App. filed June 28, 1921. On sewing machines to press seams, hems, etc., as they are stitched.

1,406,776. ELECTRICAL HEATING APPLIANCE; Leonard Sykes, Fort Wayne, Ind. App. filed Jan. 31, 1920. Means for removing element.

1,406,812. TROLLEY-WHEEL HARP; Edward Baczenski, Hamtramck, Mich. App. filed Sept. 15, 1921. Self-returning trolley wheel.

1,406,833. DEVICE FOR TRANSLATING THE EFFECTS OF SOUND VIBRATIONS INTO VARIATIONS IN AN ELECTRICAL CIRCUIT; Charles A. Finley, Brooklyn, N. Y. App. filed April 15, 1918. Telephone transmitter.

1,406,850. ELECTRIC STOVE OR HEATER; William S. Hadaway, Jr., New Rochelle, N. Y. App. filed July 31, 1915. Comprises gas emitter, a tubular resistor, and adapted to receive steam.

1,406,851. ELECTRIC STOVE OR FURNACE; William S. Hadaway, New Rochelle, N. Y. App. filed March 4, 1916. Plurality of heating chambers.

1,406,857. WIRELESS SIGNALING; Raymond A. Heising, East Orange, N. J. App. filed Oct. 26, 1916. Means for disconnecting receiving apparatus when sending and vice versa.

1,406,865. SIGNAL TRANSMITTER; Richard M. Hopkins, Rutherford, N. J. App. filed Oct. 10, 1919. Relates to "McCulloh" type.

1,406,900. HEATER. John L. R. Robinson, Reno, Nev. App. filed June 18, 1920. Heating pads for warming and curative purposes.

1,406,912. ELECTRIC HEATER; Nicholas Theofilos, Chicago, Ill. App. filed Oct. 13, 1920. Attachment for electric fans.

1,406,918. TESTING SYSTEM; William G. Blauvelt, New York, N. Y. App. filed Jan. 8, 1919. For determining conditions on telephone circuits.

1,406,953. STRAIN INSULATOR; Walter T. Goddard, Hamilton, Ontario, Can. App. filed April 4, 1916.

(Issued Feb. 21, 1922)

1,406,994. ELECTRIC WATER HEATER; Frederick W. Moffat, Weston, Ontario, Canada. App. filed April 27, 1921. Double spiral element.

1,406,996. ELECTRIC WAVE-RANGING SYSTEM; Joseph B. Morrill, St. Louis, Mo. App. filed Sept. 30, 1920. For determining position of airplanes or ships.

1,406,998. SIGNALING SYSTEM; Harold S. Osborne, New York, N. Y. App. filed June 21, 1918. Retaining wave form on long communication line by inductances.

1,407,010. CURRENT COLLECTOR; John L. Whittaker, Winthrop, Mass. App. filed July 11, 1917. Sliding trolley shoe.

1,407,028. TRANSMISSION-EQUALIZATION ARRANGEMENT; Alfred U. Harper, Evanston, Ill. App. filed Oct. 2, 1919. Constant-current flow in telephone lines.

1,407,033. FIELD-WINDING MACHINE; George C. Huggins, Lynn, Mass. App. filed May 3, 1917. Directly wound in internal slots of field frames.

1,407,035. ELECTRIC BATTERY; Alton K. Huntley, Clyde, Ohio. App. filed April 13, 1920. Dry cell of deferred-action type.

1,407,042. TELEGRAPH SYSTEM; Paul M. Rainey, West Hoboken, N. J. App. filed July 19, 1917. Automatic transfer of messages of branch circuits to main lines.

1,407,046. TELEPHONE APPARATUS; John F. Toomey, New York, N. Y. App. filed May 16, 1919. Amplifying apparatus for subscribers.

1,407,061. LIGHTNING ARRESTER; George F. Gray, Pittsburgh, Pa. App. filed Jan. 11, 1919. For low-voltage circuits.

1,407,069. METHOD OF AND APPARATUS FOR INSULATION TESTING; Charles L. Kasson, Mattapan, and Thomas H. Haines Dorchester, Mass. App. filed Feb. 17, 1920. Detects defective units of suspension-type insulators in service.

1,407,078. AUTOMATIC ELECTRIC WEIGHT-MEASURING DEVICE FOR MOVABLE CARRIERS; Howard J. Murray, Brooklyn, N. Y. App. filed Oct. 11, 1918. Integral with truck or wagon frame.

1,407,103. RECEIVING SYSTEM FOR RADIO TELEGRAPHY AND TELEPHONY; FREDERICK K. VREELAND, Montclair, N. J. App. filed Feb. 17, 1917. Baffle circuit affording passage to signal impulses, but obstructing foreign impulses.

1,407,119. ELECTRIC MINING APPARATUS; Harvey C. Berkey, Claremont, N. H. App. filed June 18, 1921. For protecting operator from shocks.

1,407,120. MINING APPARATUS; Charles W. Wyman, Claremont, N. H. App. filed June 18, 1921. System for grounding machine.

1,407,147. THERMAL AMMETER; William N. Goodwin, Jr., Newark, N. J. App. filed July 27, 1916. For high-frequency current measurement.

1,407,151. MAGNETIC PULLEY; John P. Bethke and Roswell H. Stearns, Milwaukee, Wis. App. filed Jan. 22, 1920.

1,407,205. RADIO RECEIVING SYSTEM; Robert H. Marriott, Bremerton, Wash. App. filed Dec. 26, 1916. Neutralizing stray currents.

1,407,207. ELECTRIC BRAKE; Arthur W. McAuly, Oakmont, Pa. App. filed Jan. 26, 1920. Acts against opposite sides of brake drum.

1,407,245. AMPLIFYING DEVICE FOR USE IN WIRELESS TELEGRAPHY; John B. Bolitho, Eltham, England. App. filed Sept. 18, 1920. Using three tubes.

1,407,307. CONDUIT CAP FOR ELECTRIC INSTALLATION; Wheeler H. Vibber, New London, Conn. App. filed Oct. 13, 1919. In form of bracket and screwed to support.

1,407,308. SWIVEL CONDUIT CAP FOR ELECTRIC INSTALLATION; Wheeler H. Vibber, New London, Conn. App. filed Nov. 1, 1919. Turns in direction of strains upon the wires.

Construction News

Projects, Plans, Bids and Contracts Contemplated or Under Way

New England States

AUGUSTA, ME. — The Public Utilities Commission has granted the Central Maine Power Company permission to issue $827,900 in bonds. Part of the proceeds will be used for extensions and improvements to its system.

RUMFORD, ME.—The property of the Rumford Falls Power Company has been acquired by the Oxford Paper Company. It includes a 31,000-hp. hydro-electric plant. The purchasing company has arranged for a bond issue of $5,000,000 to provide for the purchase and for proposed extensions and improvements. James A. Harris is general manager.

MANCHESTER, N. H.—The construction of a hydro-electric power plant on the Pemigewasset River, in the vicinity of Manchester, is under consideration by Herbert B. Rust, Meredith, and associates. The plans include a transmission system to supply electricity at Ashland, Wolfeboro, Plymouth, Bristol and vicinity.

MONSON, MASS.—Ricketts & Shaw have commissioned Reeds & Thorpe, 60 Prospect Street, Hartford, Conn., engineers, to prepare estimates of cost for the installation of additional equipment at the power plant at their woolen mill.

WAKEFIELD, MASS.—Improvements are contemplated in the municipal electric power plant, including the installation of new equipment to cost $50,000.

PROVIDENCE, R. I.—The Board of Education will soon call for bids for the construction of a central power house on Pond Street for service at the group of high-school buildings, estimated to cost $160,000.

HAMDEN, CONN. — Electric equipment will be installed in the one-story plant, 70 ft. x 200 ft., to be erected at Hamden by the National Filter Cloth & Weaving Company, 57 Hope Street, Brooklyn, N. Y., manufacturer of wire cloth, etc.

NEW HAVEN, CONN.—The Velvet Textile Corporation, P. O. Box, New Haven, contemplates the construction of a one-story power house in connection with a new factory to be erected at Allingtown, to cost about $100,000.

Middle Atlantic States

BATAVIA, N. Y.—The Genesee Light & Power Company will install a distributing system for street lighting at East Pembroke, N. Y.

BINGHAMTON, N. Y.—Bids will be received by the State Hospital Commission, Capitol, Albany, N. Y., until March 15 for electric wiring in the East Building and West Building and laundry equipment and drying tumbler at the Binghamton (N. Y.) State Hospital.

BROOKLYN, N. Y.—The Brooklyn Edison Company, 360 Pearl Street, has awarded a contract for two steel stacks for its generating plant to be erected at the foot of Sixty-sixth Street. Other material and equipment contracts will be awarded at an early date.

CANANDAIGUA, N. Y.—The Rochester Gas & Electric Company will begin work at once on a one-story substation on Gorham Street.

GLEN FALLS, N. Y.—Plans are under way by the Adirondack Power & Light Corporation, it is reported, for a large hydro-electric project, which includes the construction of four dams, two on the Schroon River north of Warrensburg, one on the Hudson at Luzerne and the large water-storage project on Sacandaga River.

NEW YORK, N. Y.—The United Electric Light & Power Company, 130 East Fifteenth Street, has filed plans for improvements to its substation at 208-10 Elizabeth Street, estimated to cost $20,000.

NEW YORK, N. Y.—The State Hospital Commission, Albany, will receive bids until March 22 for electric work and equipment for a new assembly hall and bakery building at the Manhattan State Hospital, Ward's Island. Lewis F. Pilcher, Capitol Building, Albany, is architect.

NEW YORK, N. Y.—Electric power plants, Diesel engine electric drive, complete refrigerating plants, electrically operated freight-handling machinery and other electrical equipment will be installed in the fifteen freight vessels to be constructed by the Central Steamship & Commerce Corporation of New York, to cost about $5,000,000. Theodore D. Wells, 11 Broadway, naval architect, has been commissioned to prepare plans.

NEW YORK, N. Y.—The New York Edison Company will erect a substation at Park Avenue and 188th Street, to cost $75,000. Ground will be broken at an early date for a substation at Yonkers, N. Y., to cost $250,000. William Whitehill, Buckley-Newhall Building, Forty-first Street and Sixth Avenue, is architect.

NEW YORK, N. Y.—The Department of Plants and Structures has made application to the Board of Estimate for an appropriation of $1,235,000 for the construction of a municipal power plant on the site of the former garbage reduction works, Staten Island, with capacity of 12,000 kw. to supply electricity for the municipal traction line, ferries and piers. An appropriation of $95,000 also has been asked for an automatic electric substation between Richmond and Tottenville, S. I., for electrical machinery and for new trackless trolley cars and equipment for the municipal traction lines.

TOTTENVILLE, N. Y.—The Staten Island Rapid Transit Railroad has surveys under way for the electrification of its system, to include power house, transmission system, etc. T. A. Davis, electrical engineer, is in charge.

TROY, N. Y.—The Ford Motor Company, Detroit, Mich., will soon commence the installation of machinery at its hydro-electric plant at Green Island. It will have a capacity of 3,600 hp. and will cost about $2,000,000. It will supply electricity for the proposed tractor and automobile plant, to be erected at a cost of about $1,500,000. Stone & Webster, 147 Milk Street, Boston, Mass., are engineers.

JERSEY CITY, N. J.—Electrical equipment will be installed in the proposed junior high school building to be erected in the Greenville section, to cost $1,560,000.

NEWARK, N. J.—The City Commission has rejected a proposition to construct an electric power plant at the new Center Market, at a cost of $117,000, and will use central-station service.

PHILADELPHIA, PA.—A power house will be erected at the dyeing and finishing plant, comprising a group of fourteen buildings at Wyoming and G Streets, for Walter E. Knipe & Sons, Hancock Street, near Berks Street, to cost $257,000. W. E. S. Dyer, Land Title Building, is architect and engineer.

PHILADELPHIA, PA. — The Braun & Stuart Company, Commercial Trust Building, will build a substation at its factory at State Road and Bleigh Street.

PHILADELPHIA, PA.—The Bureau of Transit is arranging to install electrical equipment for connection between the municipal elevated railway and the system of the Philadelphia Electric Company. The Council is preparing a contract for securing power from the Philadelphia company.

SECURITY, MD.—The Security Cement & Lime Company, Baltimore, will dismantle the power plant at its local mills and will obtain electricity from the Hagerstown & Frederick Railway Company, for which a contract has been signed, effective July 1.

CHARLESTON, W. VA. — The Libbey-Owens Sheet Glass Company will erect an addition to its power house in connection with other extensions to its plant at Kanawha City, to cost including equipment about $200,000.

LOGAN, W. VA.—The Kentucky & West Virginia Power Company, 30 Church Street, New York, plans the construction of a transmission line, about 65 miles, to Sprigg, W. Va., Betsy Layne, Ky., and other points in this district, with the erection of a number of substations in the different centers.

CLIFTON FORGE, VA. — The Virginia Western Power Company has disposed of a bond issue of $850,000, of which more than one-half will be used for extensions to its system.

MANASSAS, VA. — Arrangements are being made for extensions to the municipal electric light plant in the near future, including the installation of a Corliss type engine and a 225-kva. generator. Frank Gue, Jr., is superintendent.

WASHINGTON, D. C.—The Bureau of Yards and Docks, Navy Department, has completed plans for the following and will call for bids at an early date: Electric

substation and dry dock, South Boston Navy Yard (Specification 4,550); one turbo-alternator, for use at Pearl Harbor, H. T. (Specification 4,548); reciprocating air compressor, New York (Specification 4,555); two 300-ft. radio towers, Kutuila, Samoa (Specification 4,600), and lighting fixtures for naval hospital, San Diego, Cal. (Specification 4,595).

WASHINGTON, D. C.—Bids will be received at the office of the Commissioners of the District of Columbia until March 31 for annual supplies, including electrical supplies, etc. Information may be obtained from the purchasing officer, Room 320, District Building.

North Central States

DETROIT, MICH.—The Ford Motor Company is planning for extensions in its electric generating system to provide power for all of its factories in this district, including the Lincoln Motors Company. The steam plant at River Rouge will be supplemented by a hydro-electric generating plant in the vicinity of Flat Rock, Mich. The cost is estimated at about $400,000.

GRAND RAPIDS, MICH.—The Père Marquette Railroad Company, Detroit, will erect a power house at its proposed car shops at the Wyoming yards, to cost about $1,000,000. The different departments will be equipped with motor-driven machinery. A. L. Grandy is chief engineer.

MUSKEGON, MICH. — The Ravenna-Conklin Electric Light & Power Company will begin work soon on the power station in connection with its new hydro-electric plant.

AKRON, OHIO — The County Commissioners are planning to install an ornamental lighting system on the North Hill viaduct.

CINCINNATI, OHIO.—Plans have been prepared for a new street-lighting system which provides for abandoning 4,000 gas lamps and substituting electric lamps in various parts of the city and suburbs. It is also proposed to extend the ornamental lighting system zone to the suburbs and to replace the arc lamps now in use with nitrogen lamps. Under the new specifications it is estimated that 14,458 lamps will be required.

CLEVELAND, OHIO.—Separate bids will be received at the office of the commissioner of purchases and supplies, City Hall, Cleveland, until March 11 for hard-drawn, bare stranded copper wire, paper-insulated, lead-covered cable, and outdoor-type oil switches and accessories.

SANDUSKY, OHIO.—The Sandusky Gas & Electric Company contemplates extensions to its plant, including the installation of boilers, turbines and ash-handling equipment.

VAN WERT, OHIO. — The Van Wert Light & Power Company is planning the construction of a distributing system, to cost about $30,000.

WARREN, OHIO. — The Ohio Public Service Company has issued $4,000,000 in bonds, part of the proceeds to be used for extensions, etc.

GOSHEN, IND.—The Midwest Utilities Company, a subsidiary of the Commonwealth Edison Company, Chicago, has acquired the properties of the Hawks Electric Company, Goshen, and the Winona Light & Water Company, Warsaw. The companies will be merged with the system of the Interstate Public Service Company, affiliated with the Midwest company, adding about thirty-five cities and towns in northern Indiana to the lines. Transmission lines will be constructed to connect the systems and other improvements made.

CENTRALIA, ILL.—Work will begin at once on the proposed municipal electric light plant, to cost about $85,000.

CHICAGO, ILL. — The Chicago Union Station Company, it is reported, will soon ask for bids for a power plant to be erected at Harrison and Canal Streets, Chicago.

JOLIET, ILL.—The Public Service Company of Northern Illinois contemplates construction of a 12,000-volt transmission line, to cost about $50,000.

MATTOON, ILL. — The Central Illinois Public Service Company has purchased 180 acres of land, 2 miles from Grand Tower, on which it will erect a power plant, at a cost of about $2,000,000.

PESHTIGO, WIS.—The Wisconsin Public Service Company, Green Bay, has awarded a general contract to J. R. McDonald, Black River Falls, Wis., for the construction of a two-unit hydro-electric power plant on the Peshtigo River, Johnson Falls, to cost $500,000. Mead & Seastone, Madison, Wis., are consulting engineers.

SHEBOYGAN, WIS.—Bids, it is reported, will be opened about March 15 by the H. C. Prange Company for the erection of a power and heating plant, to cost about $60,000. W. C. Weeks is architect.

CLARINDA, IOWA.—An electric power department will be installed in the high school to be erected by the Board of Education, estimated to cost close to $200,000.

WATERLOO, IOWA. — The Council is considering the installation of a new street-lighting system in the northern section of the business district.

JEFFERSON CITY, MO.—A power house will be installed in the new plant to be erected by the Automatic Water Pump Manufacturing Company at a cost of about $150,000. Benjamin F. Schuetz is president.

KANSAS CITY, MO.—The Kansas City Power & Light Company contemplates the construction of a one-story-and-basement power house, 50 ft. x 140 ft., at 1100-12 Baltimore Avenue. H. C. Blackwell is general manager.

ST. CHARLES, MO.—Plans are being prepared for improvements to the municipal waterworks system and electric light plant, to cost about $250,000. Benham & Mullergren, Firestone Building, Kansas City, are engineers.

ST. LOUIS, MO.—The Board of Water Commissioners is planning to build a steam-driven power plant in connection with extensions to the municipal waterworks. The equipment will include electric generator, exciter, boiler and auxiliary apparatus.

ST. LOUIS, MO.—The St. Louis & San Francisco Railroad Company has appropriated $205,000 for new power plants at its shops during the present year.

AMHERST, NEB.—The Council is planning the construction of a transmission line for municipal power supply. The Electrical Development Company, Omaha, Neb., is consulting engineer.

GURLEY, NEB.—The Council is considering the construction of a transmission line for municipal electric supply. The Henningson Engineering Company, Omaha, Neb., is engineer.

LINCOLN, NEB.—A special election will be held in April to vote on a bond issue of $200,000 for extensions and improvements to the municipal electric system. George W. Bates is engineer.

ABILENE, KAN.—The Riverside Light, Power & Gas Company will construct a dam, 200 ft. long, to cost about $80,000.

RANSOM, KAN.—The Council has called a special election March 17 to vote bonds for $30,000 for the construction of a transmission line from McCracken to the city limits. The Ruckel Engineering Company, Hutchinson, Kan., is engineer.

Southern States

RALEIGH, N. C. — Surveys are being made by the Carolina Power & Light Company for a railway, 6 miles long, from a point on the Southern Railroad, probably between Norwood and Albermarle, to a point on Yadkin River near Swift Island. The cost is estimated at $100,000. H. B. Cartwright is engineer.

STANTONSBURG, N. C.—The Council is planning an issue of $25,000 in bonds for the construction of a transmission line to Wilson.

ATLANTA, GA.—The White Provision Company will build a power house at its packing plant in connection with other extensions. W. H. White, Jr., is president.

JACKSONVILLE, FLA. — The advisory park committee of the City Commission has asked for an appropriation of $50,000 in the budget next year to place all electric lighting wires underground.

MIAMI, FLA.—The plant of the Miami Electric Light & Power Company was badly damaged by fire recently. Two 2,000-kw. generators, it is understood, will have to be replaced. M. H. Hyman is manager.

ORLANDO, FLA.—Bonds to the amount of $607,000 have been voted for the purchase of the water and light plants of the Orlando Water & Light Company; also $368,000 additional to be used for rehabilitating and extensions to the two plants.

LEBANON, TENN. — The Cumberland County Power Company plans the construction of a transmission line to the Wilson Farms section, a distance of about 12 miles.

NASHVILLE, TENN. — The Council is planning for the rebuilding of the municipal light and power plant, recently destroyed by fire, causing a loss of about $100,000.

DOTHAN, ALA.—The Ludlow Engineering Company, Hartford, Ala., has surveys under way for the construction of a dam and hydro-electric plant on the Choctawhatchie River.

NEW ORLEANS, LA.—Separate bids will be received by the Sewerage and Water Board, 526 Carondelet Street, New Orleans, until March 20 for the following: (A) 1,500-1,800-hp. boilers; (b) centrifugal pumps; (c) electric machinery. George G. Earl is general superintendent.

CARTER, OKLA.—The Council has appropriated $25,000 for the construction of a transmission line to Sayre, Okla., to obtain electricity for local service. Bids will be asked at an early date.

HUGO, OKLA.—The Hugo Ice & Light Company is planning to erect an electric transmission line from Hugo to Fort Towson, a distance of 16 miles, to cost about $30,000.

PAWHUSKA, OKLA.—The Sand Springs (Okla.) Railway Company has obtained a local light and power franchise and will construct a transmission line for service about 35 miles long.

PONCA CITY, OKLA. — The municipal lighting department is considering erecting a high-tension transmission line to Bliss, Red Bank and other nearby towns.

WEWOKA, OKLA. — Improvements are contemplated to the municipal electric light and waterworks.

WOODWARD, OKLA.—Bids will be received by J. D. Barry, city clerk, March 16 for construction of a municipal power plant. Black & Veatch, 701 Mutual Building, Kansas City, Mo., are engineers.

SEYMOUR, TEX.—The Seymour Power & Ice Company is planning extensions and improvements to its system.

Pacific and Mountain States

COLVILLE, WASH.—The Stevens County Power & Light Company is planning extensions to its transmission system.

SEATTLE, WASH.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until March 22 for an operating and power building, etc. at Tatoosh Island. Specification 4574.

EUGENE, ORE. — Rights-of-way, franchises, etc., are being secured by the California-Oregon Power Company for the proposed 120-mile transmission line to extend from the hydro-electric plant on the Rogue River to Eugene, where connection will be made with the system of the Mountain States Company.

CANBY, ORE.—Bonds to the amount of $10,000 have been voted for the installation of a municipal electric light plant in Canby.

BERKELEY, CAL. — The University of California will soon break ground for a new power plant to cost about $35,000.

FRESNO, CAL.—The San Joaquin Light & Power Corporation will construct a 110-ft. high dam in the San Joaquin River for its proposed Kerckhoff development, application for which has been made to the Federal Power Commission. The equipment will include three 15,000-hp. waterwheels in each station, with 110 miles of 110,000-volt transmission lines.

PASADENA, CAL.—Plans are being prepared for the construction of a 1,000,000-volt transformer and electrical laboratory at the California Institute of Technology, to be used for experimental work.

SAN FRANCISCO, CAL. — Motors and other electrical equipment will be installed in the plant to be erected at Second and Brannan Streets, San Francisco, by the Los Angeles Soap Company, Los Angeles, to cost $150,000.

SAN FRANCISCO, CAL.—The Great Western Power Company, 14 Sansom Street, has completed plans for the erection of an addition to its power plant at Bush Street and Grant Avenue. The company will soon commence work on a new power plant at El Cerrito.

Canada

LONDON, ONT. — The Public Utilities Commission, London, is considering the extension of the hydro-electric system to Scarboro Bluffs.

RIDGETOWN, ONT. — Plans are being prepared for Howard Township for the erection of an electric transmission line from Ridgetown to Rondeau to secure service from the Hydro-Electric Commission. The cost is estimated at $35,000. E. R. Lawlor, Toronto, is engineer.

THEDFORD, ONT.—Plans are under consideration for the installation of an electric light and power distribution system in Bosanquet Township, to cost about $30,000. J. N. Wilson, 190 University Avenue, Toronto, is engineer.